

TEXT BOOK
OF
INDIAN CITIZENSHIP

VOLUME I.

TEXT BOOK OF
INDIAN CITIZENSHIP

BY
ERNEST WOOD

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TEXT BOOK
OF
INDIAN CITIZENSHIP

VOLUME I: JUNIOR

BY
ERNEST WOOD

**PRINCIPAL, SIND NATIONAL COLLEGE ; FOUNDER, MADANAPALLE
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INTRODUCTION FOR TEACHERS

THE teaching of Civics, the Science of Civilization (defined in Stage III, Chapter IX) can be expected to make a clear and permanent impression upon the mind of the pupil only if its subject-matter is brought into relation with his actual life and experience, and if it is taught with feeling as well as knowledge. The teacher must have a definite purpose in view throughout the whole course—to impart information and at the same time to awaken the social sense of the pupil through the emotions. The Teacher who feels the value of his subject in the life of the individual and the community will be most successful in this, for it is necessary to feel and to exhibit feeling without reserve in order to affect the character of the pupil. The attempts that have been made in several countries to teach Civics to school children in a purely academic atmosphere have produced poor results, leaving no permanent impressions in the life of the growing citizens. So treated, the subject takes its place along with many others which the student never relates to practical life, but merely memorises in a perfunctory or parrot-like way, and drops from his mind as soon as the examinations are over. The

present book aims at a progressive appeal to the awakening and developing social instincts of the boy or girl, leading him gradually from thought and feelings about the affairs of his own life to the larger questions of his relation to humanity, his place in the series of men, and the larger interactions of social groups.

The Junior Course, consisting of the first three stages, is intended for the training of boys and girls of ages approximating twelve to fourteen. It can be used for teaching younger children also, if the teacher simply employs the book as a guide for lessons to be framed by himself, suitable to the needs of the children whom he knows; but below the twelfth year I should not recommend that the book be put into the student's hands as a text-book, or even as a reading-book. It is, however, suitable, and indeed necessary for older students, and even for grown-up persons whose education along these lines has been neglected. The teacher in all cases knows his pupils and their environment, and it should be his care to introduce a great many illustrations from within their experience, so that the matter of the lessons may be clear and vivid to them. Grown-up people are apt to forget that words mean much less to a child than to themselves, and the teacher often fails to realise how far are the thoughts of the child from the ideas that he is seeking to convey. The child's mind is, however, very vivid

with regard to its own limited world of experience, and the teacher, like a pedlar with his basket of wares, can always gain entry there when he brings something appropriate and seasonable. New ideas can only be grasped when they are related to knowledge and experience already within the mind. They cannot be tacked on to nothing, and any attempt to force them in can only result in dimming the brilliance of youthful imagination, and destroying the natural and healthy eagerness for knowledge which is found in nearly every child.

In the Junior Course it is assumed that the emotions of the pupils predominate over the intelligence, which is awakened and developed only when the emotions are first interested. These three stages must therefore serve chiefly as a training for the emotions, and the teacher's work is to awaken and encourage these. This he can do only by feeling them strongly himself, and letting the pupils see that he feels them. He (or preferably she) must constantly show pride and dignity in the possession of human qualities of brain, head and hand. Kindness must be taught kindly, with gentle words and patient manner, dignity with dignity, human achievements with reverence, human brotherhood with enthusiasm. The class room must be full of enjoyable feeling, Civics, of all subjects, can never be taught by what are called disciplinary methods. A sense of dignity and a realisation of the power of kindness have to be

coaxed into expression from within the child's soul, and any outrage of the child's dignity by harsh words or rough manner, or any threat or rule of fear, which demonstrates the failure of kindness, ruins the lesson.

The feelings to be awakened and the information to be given in the different Stages will be evident from the table of contents, and will become clearer as the study proceeds. Much of the information is more in the nature of illustration than of instruction, and must be kept subordinate to the main purpose of awakening social desires and the true spirit of civilization. How they lead up to the studies in the Senior Course may be seen by reference to the Synopsis of the latter at the end of the Contents pages. Hygiene and Sanitation are an important branch of Civics, but are very briefly treated here as they are usually taught as a separate subject. With reference to Stage One, it may be noted that most people, strange to say, do not realise that they are men, and this is partly the reason why many so easily degrade themselves below the human lot. The Rig-Veda states that minerals exist, plants feel, and animals know, but know not that they exist, feel and know; while man exists feels and knows, and also knows that he exists, feels and knows. But it is to be feared that this knowing is sadly imperfect among our citizens the world over, and civic life consequently suffers. The knowledge of what it means to be a man must

become a constant realisation, coupled with a sense of human dignity and worth. If animal motives are frequently breaking out among men, the community is bound to suffer, for true civic life, or civilization, implies human motives in the citizen, and the abiding emotions of manliness and womanliness which can become permanent in character as a result of the studies outlined in this first stage.

I have assumed that the average school works for thirty-six weeks in the year, and that two lessons in this subject will be given each week to each class. Allowing for time taken by occasional holidays and revision, I have estimated that sixty-six lessons will be given in the year. Each one of the twenty-two chapters of the first stage, which is the first year's course, may be made the subject of three lessons. If only one longer lesson is given in each week I should recommend the teacher to mark out eleven of the chapters which seem to him the simplest; using each of these for one lesson, and each of the remaining chapters for two lessons, he will thus make up thirty-three lessons for the year's course. If the entire book is introduced into the school as a four years' course, beginning perhaps with the thirteenth or fourteenth year, I should advise that each chapter be taken for one week's work, so that the three stages will be covered in two years.

Adyar, Madras
June, 1920

ERNEST WOOD

NOTE

I TENDER my thanks to the proprietors of "Bibby's Annual," "The Scientific American," "Leslie's Weekly," and "Munsey's Magazine," Messrs. Becker & Co., and others, for their kind permission to reproduce a number of the pictures which appear in this book.

E. W.

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TEXT BOOK
OF
INDIAN CITIZENSHIP
VOLUME II. SENIOR (IN PREPARATION)

SYNOPSIS

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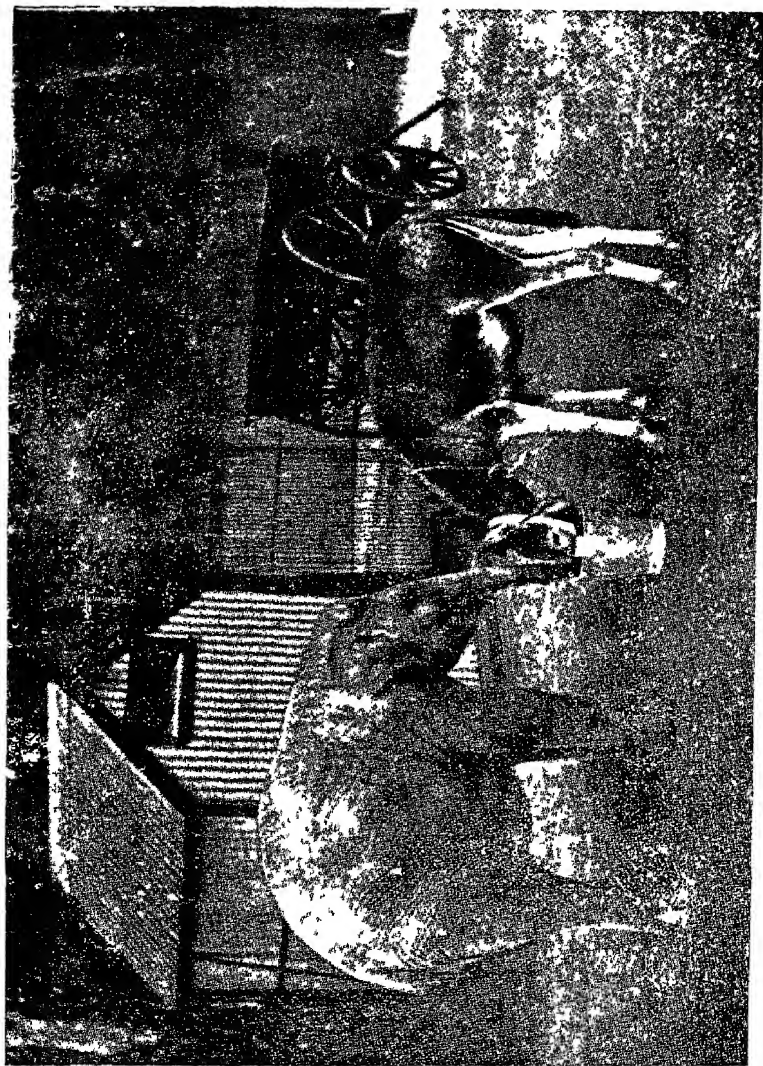
Public and private property. Public and private purposes. Country roads. Town streets and roads. Buildings. Housing conditions. Common land. Parks. Forests and afforestation. Water supply. Drainage. Railways. Canals. Mines. Ports. Post Office. Telegraphs. Money and banking. Insurance. Provision for old age. Hospitals. Medical laws. Pure food and drugs. Weights and Measures. Law Courts. Prisons. Asylums. War. Arbitration. Famines. Marriage. Societies. Clubs. Libraries. Art Galleries. Museums. Monuments. Newspapers. Magazines. Schools, Colleges and Universities. Temples, Mosques, Churches and Mutts. Tirthas. Etcetera.

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GOOD FELLOWSHIP

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STAGE I

MAN, WHAT HE IS AND WHAT HE CAN DO

PART I

MAN AND HIS ENVIRONMENT

1. Our Life.
2. Other Lives.
3. The Unity of Life.
4. Man and the Animal World
5. Man and the Vegetable Kingdom.
6. Man and the Devas.
7. Man and the Minerals.
8. Clothing and Shelter.
9. Play and Work.
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CHAPTER I

OUR LIFE

WHEN we rise in the morning, freshed by the night's sleep, what do we do, and ~~what~~ what do we see and feel before we once more retire to rest at the end of the day? Our daily life in the world is made up of two kinds of living, namely, sensing and acting. It is said that we have five senses in the body, so that we are able to see, hear, feel, smell, and taste something of the world around us. There are also said to be five organs or instruments of sense, namely, the eyes for sight, the ears for hearing, the skin for touching or feeling and for the sense of heat and cold, together with the muscles for sense of pressure or weight, the tongue for taste, and the nose for smell. From all these organs little threads called nerves, which act like telegraph wires, carry to the brain information about the things that exist in the world around us. In addition to organs of sense we have organs of action, so that we are able to walk, to pick things up, to speak, and to do many other things which we call actions.

What takes place in our lives by means of the organs of sense and action is called our outer life,

but we have an inner life also, which is made up of our emotions, such as love or anger, our thoughts, and our will. When impressions have been carried by the nerves to the brain and have entered our inner life also, we are able to think about the things that we see, and with the aid of our imagination we can live a life of thought inside our own minds. For example, when we ~~are~~ lying in bed we can imagine that we are playing ~~in a~~ field, sitting in school, talking to friends, or building a house. We can think over the things that happened yesterday, last year, and even many years back, because we have memory; and we can form some judgment about what is likely to happen to-morrow, next year, and even many years hence. For example, we know that after many years boys and girls will be grown up men and women, living a life something like that which is lived by their fathers and mothers now.

While we have thus an outer life and an inner life of our own, we live among other beings who have also inner and outer lives of their own, and many of these have sense-organs and instruments of action which are also something like ours. For example, horses and cows have eyes, ears and so on, but they have not hands with which to lift things or to work. Our outer life is combined with that of all the beings and objects around us—we cannot live separately. And all the time we are affecting the world around us (including men and women and children, animals,

plants and all kinds of objects and things) by doing various acts with our limbs and other parts of our bodies. For example, we breathe the air into our lungs, and then breathe it out again in an altered condition ; we pour water over our bodies when we bathe ; we drink and eat, taking into our own bodies food from outside ; we cover our bodies with clothes made from plant fibres or wool from animals ; we speak to people and touch them , we read books and letters and write letters for other people to read ; we walk and run and play, and perhaps we make things with our hands or with tools. Indeed, in the course of the day we do a great many things which affect the lives of other beings and the condition of objects in the world. The lives of other people, as well as animals and plants, become different because of our existence and our actions.

Our own life is also affected by our actions, and by the actions of others. When we see something new our thoughts become different, and our inner life is changed. When we are told something new also there is a change in our minds, and we are happy or sad on account of these things. Whenever we see a beautiful sight, such as the colours of the sunset, or the rich green fields of paddy or the yellow ones of corn, or the glorious mountains in their strength, or the powerful ocean, our inner life is made more beautiful, richer and stronger. When we listen carefully to delightful music, it calms our

feelings and perhaps increases our devotion. So also the smell of roses, jasmines and many other flowers, produces a change within our minds.

Without our inner life of thinking and willing, our outer life of action would become foolish and even impossible. Without these it would not be safe to walk about; we should tumble down steps and walk into people in the street, and we should not know that a chair is meant to sit on or a table to write at. We should not know how to unbolt a door, and we should turn over our cup without knowing that the water would run out. We should not know where to go or what to do. But as it is, the inner life is the seat of all our enjoyment, and as good citizens we must understand that all the people and animals about us have inner lives and outer lives, and it is our duty to do nothing that will harm either of these.

In order to live this life of ours we find that certain things are necessary. The body, with its sense-organs, has to be kept alive and well. First of all, we must have food and drink. Our bodies are wasting away all the time, in breathing out heavy gases, in perspiration and in other ways, and we have to make up for the waste by eating and drinking every day. So we have to think about food, and where and how it is to be obtained, and we have to work for it. Then, our bodies are not hard and coarse objects, like lumps of wood or stone. They

are machines delicately made of very soft material, and we have to take care to keep them in good order, or they will become ill and be a trouble instead of a help to us. We have to take even more care of them than we should do of a new bicycle. For example, we must not leave them out of doors all night in the rain, where they may get wet or chilled. We must put them in a clean, safe, dry place, before we go to sleep. So also in the day-time, we must not expose our bodies all the time to the fierce heat of the sun. Therefore we need shelter for the body from the rain and the extreme heat of the sun, and sometimes from excessive wind, and we require a safe clean place for it. That is why we have houses and we have to think about houses, and to work to build houses. We have to cover the body also with suitable clothing when necessary, sometimes to keep it warm in the cold weather, sometimes to protect it from the heat of the sun, and sometimes for the sake of customary appearances.

Notice then, that our outer life has three chief necessities—food, shelter and clothing. Animals, birds, insects and even trees have to work for food, and many of them also for shelter. But even when our three necessities are satisfied, there are the necessities of our inner life, which will make it strong, rich in material, and beautiful. These are kind feelings, strong and clear thoughts, and deep devotion.

CHAPTER II

OTHER LIVES

WHEN we look about us in the fields, in the forests, or on the mountains, we see many kinds of creatures living in this world of ours. Indeed, if we call it our world, we must think that the word 'our' includes all these creatures, not only men; for man is only one of the many different creatures for whom the world exists as a place for living in, and it would be a mistake to think that the world exists for man alone. Some writers of ancient books have said that there are more than eight lakhs of different kinds of bodies, which they have described in two great classes, the moving and the unmoving. All these beings form a great family to which we belong.

When we look at a tree, for example, we might think that it is an unmoving creature, and that is true, in so far as it cannot walk or fly about from one place to another, but it is able to move in a very limited way, able to send out roots in search of moisture and food in the soil, able to stretch up its branches and leaves to the sunshine. When you plant the seed of a tree in the ground, it often

shows a great deal of what in a human being we should call intelligence.

Soon after the little sprout appears, it turns itself up through the earth towards the surface of the soil, where it will find the sunshine for which it seems to be always seeking. How



TEMPLE WALL, CHIDAMBARAM

does it know, buried in the dark earth, which way to grow to find the light? If you take the little seed that is beginning to sprout upwards, dig it up and re-bury it with the sprout pointing downwards, presently it will begin to turn once more upwards towards the surface of the earth. Next consider the strength within the seed. So long as the young plant receives water and food from the earth, and light and air that it needs, it will often go on growing in a crack in a wall, and it is so strong that it can lift up the stones of huge temple walls. At Chidambaram, in the South

of India, there is a temple built of enormous blocks of stone, some of them being as big as a hut, very closely fitted together, and in some places the high walls built of many stones have been lifted and cracked by small growing plants. So the tree or the plant is only unmoving when compared with ourselves, for we can walk and run about on the surface of the earth.

Consider the birds that are able to fly for a very great distance high in the air, which we cannot do. They are able to move about more freely than we are. Some of them travel thousand of miles every year. They set up their winter homes in warm countries, and when the hot weather comes they fly away in a large band, and set up their summer homes in a cool country, so that they are never troubled with great heat or great cold. If these birds were able to speak to us they might call us unmoving creatures as compared with themselves. In the matter of the senses we often find a difference between man and other creatures. Many dogs have a keen sense of smell of which man can form but little idea, but the sense of smell of various insects is still more powerful and varied. Some of them can smell each other at a distance of miles—for example, the Oak Eggar moth. A naturalist developed one of these out of the cocoon from which it comes in a little box in his room in the middle of a large town, and before very long other moths of the kind came fluttering into

the room from the moorlands miles away. They did not come at other times, and even a contrary wind could not deter them. By wonderful powers of smell or some other sense of which we know nothing they knew of their imprisoned friend and came to visit her. We human beings live mostly with our eyes—they give us our outlook upon life; but with the ants it is different—their 'outlook' is probably that of smell or some other sense connected with the movable antennæ which they bear like horns upon their heads.

What advantage, then, has man? In the outer world he has hands with which he can work and make things, and his inner life, made up of his thoughts and feelings and will, is richer and stronger than those of any other creature, as we shall see in later lessons.

Every good citizen must be ready to enter into the life around him in a spirit of comradeship, especially with men, but even with the animals and plants which come prominently into his life. He must always act with the full knowledge that life consists of giving and taking among all beings. Nearly all the creatures that we see have bodies like our own in some respect, and all enjoy their life as we do. All have bodies; all have selves within the bodies. There are many differences—birds have wings; men have hands and feet; horses, bulls, elephants, deer, and many other animals go on four feet; snakes glide

along the ground on their muscles ; fishes swim in the water with fins and tails ; trees stand in their places by means of roots—but all have their inner and outer life, and all have need of food and protection. We shall study something of kindness to animals in our next lesson, but meantime let us follow the thought of this verse from Kālidāsa's *Shakuntalā*, spoken by a hermit to king Dushyanta when he was hunting

Now heaven forbid this barbed shaft descend
Upon the fragile body of a fawn,
Like fire upon a heap of tender flowers
Can thy steel bolts no meeter quarry find
Than the warm life-blood of a harmless deer ?
Restore, great Prince, thy weapon to its quiver,
More it becomes thy arms to shield the weak,
Than to bring anguish on the innocent.



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A GOOD SHEPHERD



'White Sheep winding slow their way'

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CHAPTER III

THE UNITY OF LIFE

He spake
Of life, which all can take but none can give,
Life which all creatures love and strive to keep,
Wonderful, dear, and pleasant unto each,
Even to the meanest, yea, a boon to all
Where pity is, for pity makes the world
Soft to the weak and noble for the strong.

A STORY is told of the Lord Gautama, the Buddha, who lived in India about two thousand five hundred years ago, that once, when he was wandering in search of spiritual knowledge, he came upon a flock of goats and sheep which were being driven down the hill side at high noon. Among the flock was a ewe with two little lambs, and one of these was limping, on account of a wound in the leg; and the mother was running anxiously from one to the other of the lambs, fearful of losing either of them. The holy man, full of pity for the mother sheep, picked up the wounded lamb, and walked with the flock, carrying it on his shoulder; and as he talked with the herdsman he learned that the animals were being driven down into the town for a sacrifice which was to be held by king Bimbisāra. On

arriving in the great hall where the sacrifices were being made, Gautama spoke to the king and the people with such words of compassion and persuasion that they stopped the sacrifice, and the king issued an order that no more animals should be slaughtered either for sacrifice or for meat, "seeing that life is one and mercy cometh to the merciful". The beginning of Gautama's noble speech appears in the words at the head of this chapter, and the following are the reasons which he gave for kindness to animals.

(1) We cannot give life, and we have no right to take it unnecessarily ;

(2) All creatures love their lives, even the little ant, the worm and the fly, and life is very pleasant to the weak if they are treated with kindness, and a great joy to the strong when they feel the happiness of helping and protecting the weak ;

(3) Man prays to God ; let him not be unkind to those weaker creatures to whom he is as a god ;

(4) Especially should man not be cruel to the animals which have given him milk and wool, which have worked for him and have put their trust in him, for that is ingratitude ;

(5) All these creatures are beings like ourselves, though not so far advanced in knowledge and the power to work, they have to learn by living, and to kill them is to stay their progress, which is a sin against the unity of life ;

(6) If the gods are good, they will not be pleased with blood or cruelty ; if they are evil we should not serve them ; and

(7) Man will surely have to pay in suffering for the pain which he inflicts upon others weaker than himself, since the whole world is governed by the laws of God, who is perfectly just.

Then he went on to teach

How fair

This earth were if all living things be linked
In friendliness and common use of foods,
Bloodless and pure ; the golden grain, bright fruits,
Sweet herbs which grow for all, the waters clear
Sufficient drinks and meats.

It is one of the first duties of a good citizen to see that in his life there is no cruelty to man or beast. There should be no unnecessary pain or hardship inflicted upon the animals which work for him—carts must not be overloaded, bulls must not be heavily laden on the back, cattle must not have head tied to leg, birds and rabbits and other small animals must not be shot for amusement, and animals must not be beaten or starved or uselessly deprived of liberty.

We can all see that trees and plants have some kind of a life of their own. We see them droop in the dry season and revive when the rain comes, and that this is not merely a lifeless action has been proved by the great Indian scientist, Sir Jagadish Chandra Bose. The plant has not such highly developed organs as we have ; it has not an eye like

ours, for example, but it has something corresponding to an eye in a less developed form—it has foliage sensitive to light. Even the commonest vegetable is sensitive, and all plants have a simple nervous system which does for them what our nerves connected with our sense organs do for us, that is, they transmit the impressions from outside. Of course, plants have not so much intelligence as animals, but they are beings capable of feeling pleasure and pain in a small degree. Some are very ready to show feeling, like the Sensitive Plant, which if touched, folds up.

By means of a fine silk thread fastened to the leaves of a plant and connected with an electric pen, Dr. Bose has been able to show that all plants are sensitive. If a plant is suddenly pinched or cut, or touched with a hot wire, the stalk winces and then recovers, just as our arm would do if it were suddenly pinched; and though these motions are too small to be seen by our eyes, they can be seen by means of Dr. Bose's scientific apparatus. Strange as it may sound, the plant also gives a little start when there is a sudden noise, like the banging of a door, just as we should do ourselves. Dr. Bose has arranged for some of the trees in his new garden in Calcutta to keep a record of every cloud that passes across the sun.

Any one who has been very ill and has had to lie in bed for weeks or months, knows how weak the muscles become through disuse. If you tied your

arm at your side and did not use it for a long time, you would find that the muscles had become weak from want of exercise. Dr. Bose found that this was the case with the mimosa plant, which he kept in a glass case, so as to protect it from outside shocks. When he came to experiment with it, its system was so enfeebled that it could not transmit shocks—it was what we should call numb in the case of an arm. Then he gave the plant a number of rapid knocks as though to wake it up, and presently it got back its lost activity and was able to use what we may call its nerves. By many experiments it has been proved that plants can be made numb with cold, made drunk with alcohol (the spirituous liquor that is in toddy and other drinks which intoxicate men), put to sleep by certain gases (such as chloroform), suffocated by bad air, depressed by gloomy weather and too much rain, shocked by blows, and killed by poisons or by violence. It has been shown also that all plants die suddenly when their heat is raised to a temperature of 140° F. They give a sudden little jump which is their death spasm and after that they cannot again be brought to life or made to give a response to touches, knocks, pinches or cuts.

It is one of the duties of a good citizen to do no unnecessary damage to beautiful old trees, or to the flowers and plants which grow in our gardens, parks and fields, and by our road-sides, to see that forests are not cut down unless new ones are also planted,

to preserve shade trees along the roads, and to have about his own dwelling some trees and plants, so that he may live on good terms with the vegetable as well as the animal kingdom during his life.

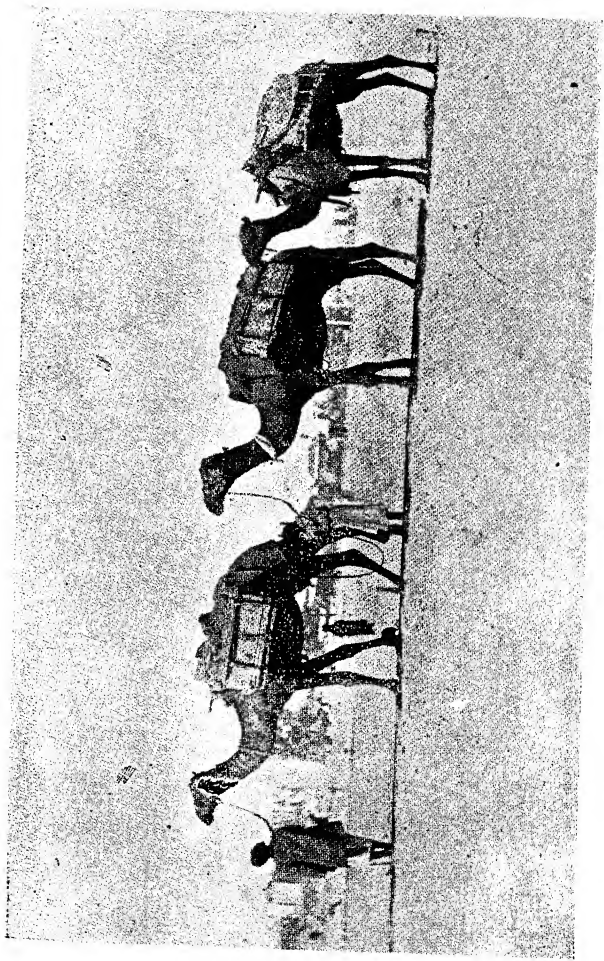
Not only are men, animals and plants living—there is no dead matter in the whole world. The same great scientist has demonstrated what many ancient spiritual teachers have told us—that even a piece of iron or a grain of sand has a simple condition of life. He found that pieces of metal would become torpid when frozen. He found that they could be sent to sleep by certain medicines, and afterwards revived by others. He found that if he pinched them suddenly they gave an electric twitch, just as the muscle of your arm would do. He found that they become tired by overwork, and grew well again after a rest. He found that they could be poisoned with certain drugs, and afterwards cured by suitable medicines. So a machine, for example a watch, can become tired if it is constantly worked, and it will do its work better if it is allowed an occasional rest. We are not able to see the response of metals with our eyes, but it is shown by the delicate apparatus which the doctor made.

It has thus been shown that life is all one. This is what Dr. Bose said in one of his speeches. "It was when I came upon the mute witness of the self-made records, and perceived in them one phase of a pervading unity that bears within it all things—it was



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Collie Dog and Lambs



PACK CAMELS

[To face page 19

then that I understood for the first time a little of that message proclaimed by my ancestors on the banks of the Ganges thirty centuries ago *They who see the One in all the changing manifestations of this universe, unto them belongs eternal truth—unto none else, unto none else.*”

CHAPTER IV

MAN AND THE ANIMAL WORLD

FROM the Vedas, the Itihāsas and the Purānas we learn that in ancient times men valued their cattle, especially cows and bulls, as their most cherished possession. So highly indeed were animals esteemed in ancient days that people took pleasure in the thought that they were useful not only to man but even to the Devas, and delighted in the pictures of Śiva with his bull and serpent, of Viṣṇu with his eagle, of Gaṇeś, the elephant-headed, with his rat, and of Subrahmanya riding upon his peacock, and in the thought of Hanumān and Sugriva, the monkeys, and Jatāya and Sampātī, the eagles, as dear friends of Rāmachandra, the Divine King. In the Purānas the roads of heaven are described as beautified by the presence of swans and other water-fowl, and splendid elephants and horses descended from divine families of Airāvata and Uchchaiṣhrava. In Sanskrit when it is desired to say that something is the best of its kind, we sometimes call it Vṛiṣhabha or Rishabha, as in the case of Arjuna, whom

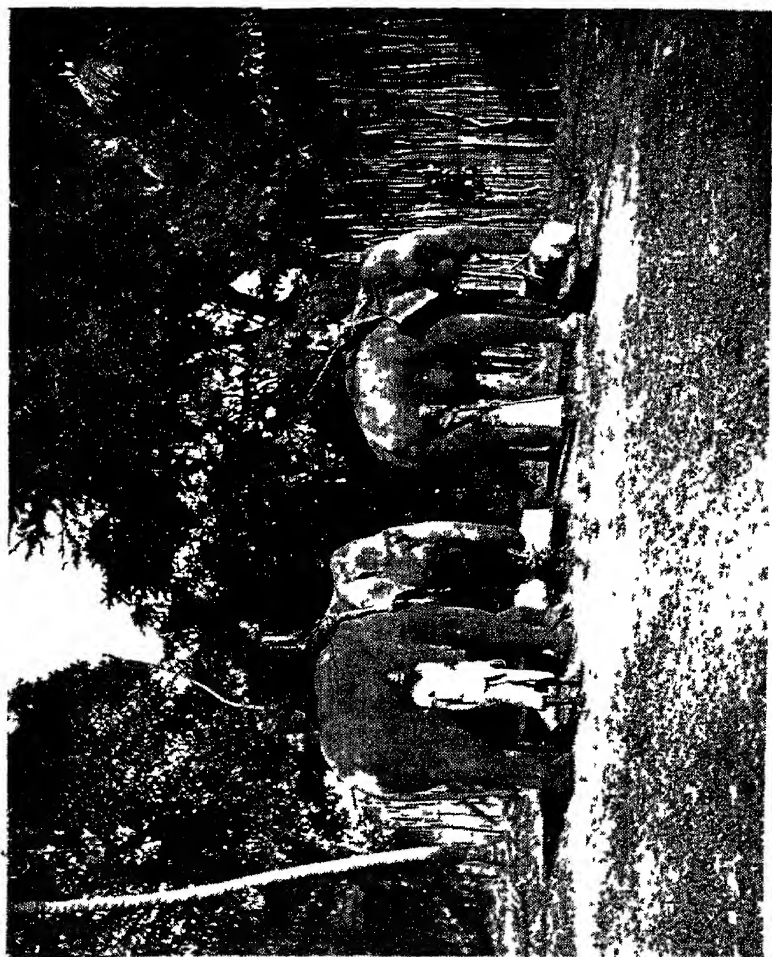
Shri Krishna repeatedly calls Bharatarshabha, which means "bull among Bhāratas," or "best of the Bhāratas."

Animals are thus cherished for their usefulness, their beauty and their companionship for man. Just as Shiva and Vishnu rejoice in Nandī and Garuda, so do men in their lesser regions love their animal friends, and very often a strong friendship grows up, as between Shakuntalā and her deer in Kālidāsa's immortal play. The Bedouin Arab so loves his horse that it shares the same tent with him and is almost a human companion.

The animals serve us in a great variety of useful ways. The cow, the buffalo and the goat give us their milk. The bull ploughs our fields, stamps out the grain on the threshing floor, works our oil-mills and draws our carts. The sheep give us their wool, and even the humble worm provides silk which is prized by kings. The horse carries us and our loads swiftly along the roads and through the mountain passes. Elephants in Burma and on the Mangalore coast lift up and arrange the logs of timber that we use all over India for building purposes. The camel carries us hundreds of miles over the desert, where without it we dare not go. The domestic dog guards our property. Even jackals, hyenas, vultures, beetles and other creatures which seem unpleasant to man clear up decaying rubbish and dead bodies that would otherwise smell bad and make us ill, and

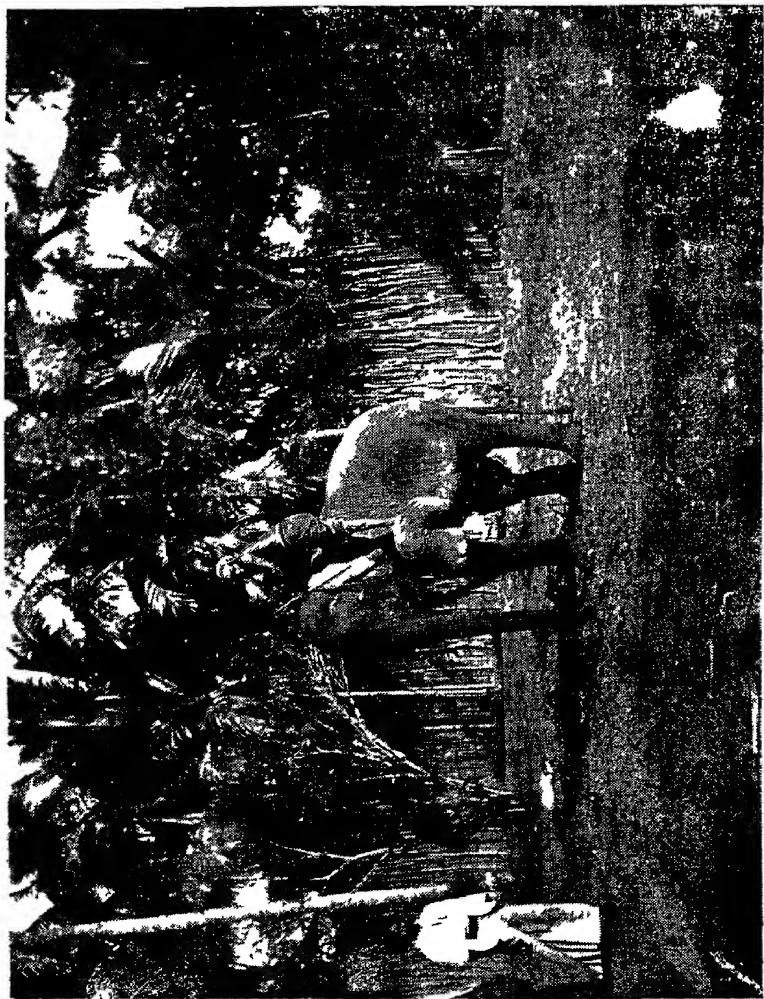
the white ants (so destructive in our houses) turn over the soil and ventilate it, making it yield rich crops. In colder countries the humble earthworm does this useful work, and in every acre of land there are about fifty thousand of these burrowing creatures, continually busy in the work of providing soluble earth-foods for the roots of plants, letting the air into the earth, and draining it, and drawing decaying leaves and other matter under the surface, where they enrich the soil. Though they do harm sometimes, these little creatures are of inestimable use, as without them the soil would lose much or nearly all of its fertility

Just as the living creatures that share the world with us serve us, so we serve them, sometimes with intention, and sometimes unknowingly. Man enriches their lives, their feelings and their thoughts, by providing them with experience which awakens their affections, intelligence and moral power. The ploughman, for example, thinks of the harvest that is to come, and has thus a reason for what he does, but the bull which helps him to plough does not understand why it works. It may be beginning to understand, but that is all. Yet it is learning to obey his directions and to understand them, and as a result of kindly treatment it is learning to appreciate kindness and to develop a little gratitude. It is just so with man, who does not understand why he lives, but is beginning to learn a little of it from the great



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Elephants carrying logs



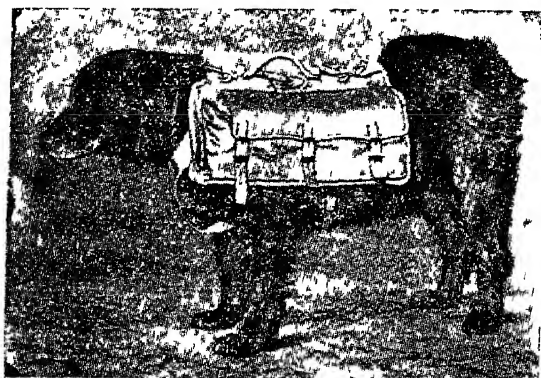
Mounting an Elephant

[To face page 23]

religious teachers, the sacred books, and association with the wise.

Many animals have capacity for very quick mental and moral growth in the company of man, who has thus the duty of raising them in evolution in return for their services to him. Horses, bulls, camels, elephants and other creatures soon learn to understand the tones of the human voice and the meanings of the cries of driver, rider or cowherd. Some of the most intelligent domestic animals, such as dogs, get to know their own names, so that they will come when they are called, and even learn to understand a number of words and sentences in the language of their masters. Perhaps the best example of this is the sheep dog, which knows its duties and obeys the shepherd's words. Sometimes the shepherd has two dogs, one of which drives the sheep along while the other collects them together and keeps them from straying far away, and so clever are these animals that if their master calls to them to turn to the right or to the left they do so at once. Sometimes competitions are held on sports' days, when a number of little flags, some red and some white, are placed in a field and the intelligence of the dogs is tested. The master, standing a long way off, calls out "Round the red flag, between the two white ones," and so on, while the dog turns his little flock of sheep accordingly. The dog understands also the expression of its master's face, the meaning of his

gestures, and whether he is pleased or angry, glad or



sorry, happy or sad. It is this high intelligence of the dog that made it so useful in the recent Great War that some were employed as sentries, others to

A WAR DOG

bear written messages across dangerous ground where no man could have passed unseen, and others to carry food and ammunition to men in the front line. Training schools for dogs were soon established; stray dogs were collected and sent to these, and many were the lives saved by their work.

While the animal advances very rapidly in intelligence in association with man, it grows still more rapidly in moral sense and power. Thus the domestic dog learns to be affectionate, gentle, faithful and clean, and it develops a sense of shame and a quality of patience, and willingly sacrifices its own pleasures and passions in its devotion to the behests of its superior companion, man. A pretty story is told of a dog which grew very old in the service of an ungrateful master, who decided that he would drown the animal which was no longer of use to him. So dog and man went out in a boat. But it happened that



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A PRIZE COW



A PRIZE HORSE

[To face page 25]

the boat capsized and the man could not swim, and he would have been drowned but for the brave and intelligent animal, which brought him safely to land, and made him thoroughly ashamed of his ingratitude and cruel selfishness

Another way in which man helps the animal kingdom is by deliberate breeding, by which farm stock (cows, sheep, pigs and other animals, and fowls) have been raised to a high pitch of physical perfection by means of careful selection, as will be seen in the accompanying pictures of an English cow and a splendid heavy horse or stallion; while the mule, a cross between a horse and a donkey, is very serviceable for transport and work in which great endurance is required.

In civilised countries there are laws which prevent cruelty to animals, but the good citizen will not need such restraints for his own good heart will make him kind, and his understanding will help him to know how to assist his dumb friends to grow in affection, intelligence and moral power

CHAPTER V

MAN AND THE VEGETABLE KINGDOM

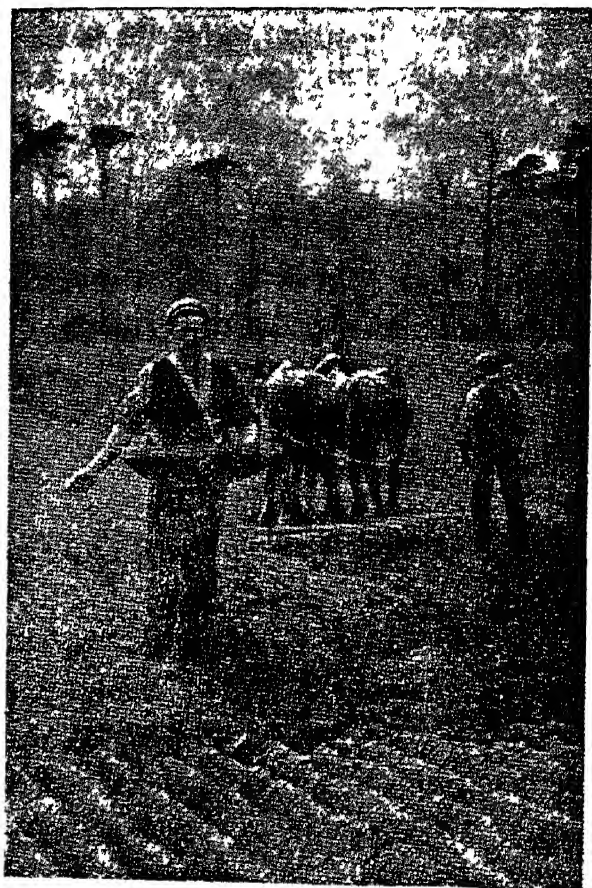
IF you were to stand on a high mountain, such as the hills at Kodaikanal in South India, from which you could see over many miles of the plains lying below, you could not fail to notice that in the great brown extent of sun-scorched land there are large patches of green connected by long thin lines, which look mere coloured threads in the distance. The patches of green are the tracts round towns and villages where man is living in company with the vegetable kingdom, irrigating the land for food, and cultivating fruit trees and shrubs and flowers. The long thin lines are the great main roads, distinguished by rows of splendid shade trees on either side.

There are four main things that man does for the vegetable kingdom, which includes the vegetables, grasses, shrubs and trees, and generally all those creatures which live with roots in the earth. He *selects, protects, nurses, and cultivates* them. In return for this the vegetable kingdom provides him with food, clothing, shelter, and hundreds of things

of usefulness and beauty which make our lives rich and happy.

The *selection* that man makes consists very largely of choosing the best seeds and cuttings—thus the farmer who grows paddy or cotton will always keep aside a quantity of the best grain or seed for sowing.

In this way he is constantly improving the quality of the plant. He *protects* them by weeding the ground in which they are planted, clearing the undergrowth in the case of trees, and guarding them against des-



SOWING

tructive animals and plant diseases. Small weeds grow up in every field and these must be removed or dug into the soil before they become seedy, for if

they are left too late they will produce many more weeds in the next season. Weeds rob the crop of the plant-food that is in the soil as well as of water, they cut off light and heat, and collect injurious insects, sometimes they grow over the crop and drag it down or fix themselves upon it and suck out its vitality, while many are poisonous; and when they abound, let us say in a field of potatoes,



REFAPING

the result often is that the crop is reduced by half, and that that half are not so large and rich as they would have been. Yet all these plants that we call weeds are of use to man, for

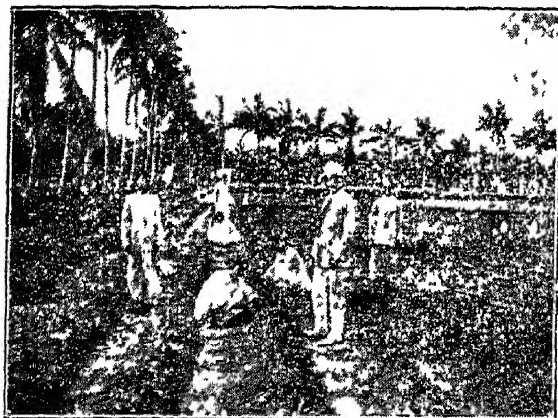
making medicines and many other things, and even for enriching the soil when they are dug in they are

only injurious among the crops when they exist in the wrong place and at the wrong time

Man *nurses* the plants and crops by providing them with water and manure in suitable quantities, by sowing the seed at the right time or season, in the soil that is best suited for the crop, and in the climate in which it will naturally flourish, and by varying the plants sown on the field each year, by what is called rotation of crops. He has studied these things and he knows what soil is suitable for cotton, what for paddy, and so on, and what quantity of water and manure is necessary for each. Many plants and flowers have been raised to a high state of culture with his aid, for he has learned not only to select, nurse, and protect, but also to combine or breed these rooted creatures, so as to produce types of greater richness and beauty. Thus from the combination of the seeds of inferior grasses he has produced grains, and by culture of the wild roses with their single row of petals he has helped Nature to bring forth the beautiful many-petalled roses of the gardens.

Much as we thus do for the vegetable kingdom, it is little as compared with what the vegetable kingdom does for us. It provides us with food and the fuel that is required to cook it—grains like rice, wheat, corn, oats, barley, ragi, vegetables that grow below and above ground, such as potatoes, turnips, brinjals, peas, beans, cabbages, sugarcane, oils ;

fruits such as the plantain, orange, lime, mango, apple, date, fig, nuts like the cashew and the coconut. It gives us cotton, jute, hemp, and other fibres



AGRICULTURAL STUDENTS AT WORK

for making cloth, string, rope and paper, and the material for making them beautiful with colour in the form of vegetable dyes, grass mats for our floors,

timber for doors, windows, rafters and furniture, thatch for the roofs of houses and cottages, and many forms of musical instruments and



STUDENTS AT WORK

other objects of delight. Consider, for example, how much can be made from the coconut tree. Its fruit provides for us a nourishing food and a

valuable cooking oil. Its leaves make excellent roofing material, its bark in parts is a natural cloth.

The covering of its nut is good for ropes and mats, and its trunk is suitable for posts and for aqueducts or water-bridges.

For use and beauty, therefore, is the vegetable kingdom dear to man. How unhappy should we be without the beauty of the green fields of paddy and other crops, and the delightful shade of the glorious trees. What dear friends are these, with whom we live in harmony, as part of the same great world of life. The Sages of India loved the trees and ever spoke of the forest of Naimisha and the all-sufficing gardens of Nandana. One western philosopher, Emerson, was so fond of the trees in his garden that he used to shake hands with their lower branches when he returned home after a journey, saying that he could feel that they were glad of his return, and his Indian counterpart is Dr. Rabindranath Tagore, who sees in communion with Nature one of the greatest uplifting forces for man, and will have none of that modern theory which supposes man and Nature to be in perpetual conflict.

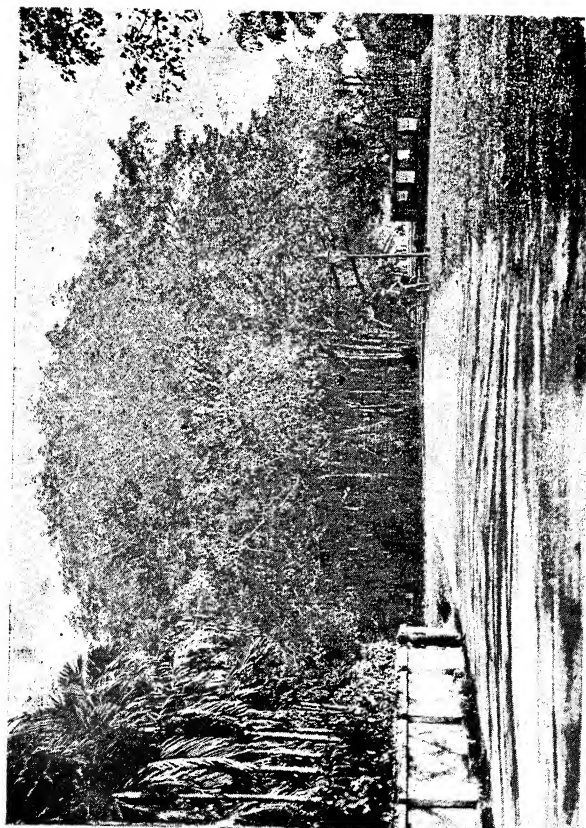
CHAPTER VI

MAN AND THE DEVAS

IN the last two lessons we have considered man's relation to the world of moving creatures in two classes, called the animal and the vegetable kingdoms. Before we turn to the study of the unmoving or unorganised creatures, we must observe that there are many other kinds of moving beings about whom we learn something in the course of our religious studies. There are millions of beings that we cannot see with our physical eyes, because their bodies are constructed only of subtle matter, but we find them mentioned and sometimes described in the religious books. The Muhammadans speak of them as jinns and angels of different kinds ; the Christian scripture speaks of them as angels, archangels, seraphs, cherubs, principalities, powers and dominions ; but it is in Hinduism that one finds the fullest account of those millions of invisible beings who are classed under the general name of Devas, who live in the various *lokas*, move about unseen among men, and animate all the varied forms of Nature, helping in their growth and taking part in all their changes



A GIANT BAMBOO [To face page 32]



A Large Banyan Tree

[To face page 33]

according to the definite laws which govern all states of being and change. Some of them are spoken of as superhuman, in various grades of splendid power and knowledge, reaching right up to those who are the direct ministers of the Ruler of our world, and among these are men who have finished their human destiny and have gone on to live a more glorious life in the invisible world. Some are the equals of man, while myriads of others, which are specially connected with animals and plants and minerals, are not yet equal to humanity in intelligence and power.

Some people think that to be a good citizen it is not necessary to know about these beings, and that is true in the case of all those whose hearts are kind and full of an instinctive love for animals and plants and for the beauties of Nature. Where that is not the case there is always the danger that man will fall into error, and break the concord that should exist between him and the devas. To take only one example—a person who carelessly destroys flowers and damages beautiful trees, or who is cruel to animals and kills them when it is not absolutely necessary, is outraging the feelings of those invisible beings who are building up the vegetable and animal forms, and are working, like artists, to make the world full of beauty and perfection. Imagine how you would feel if some ruthless person were to throw ink over your book or your clean clothes, and roughly crumple and tear them, or how a man who has spent years of his life carving stones

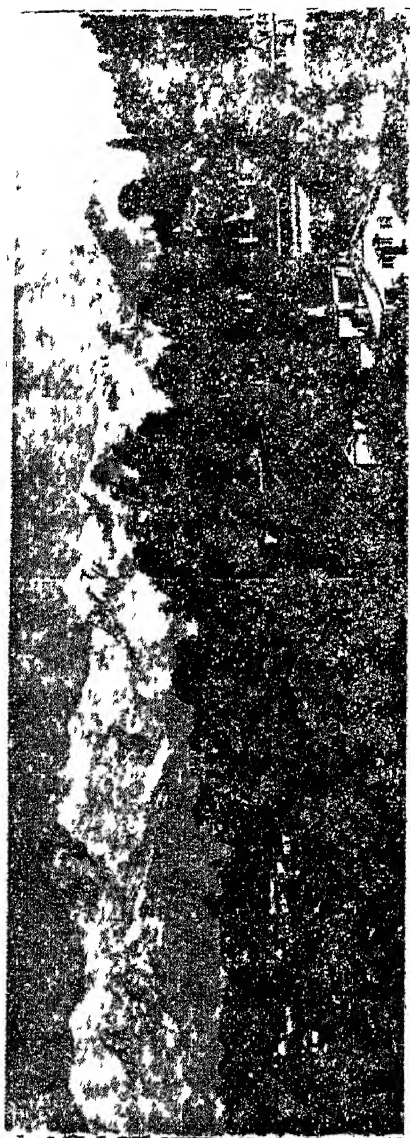
and building them into a beautiful shrine would feel if some rough giant were to come and smash them up with a hammer, and then you will see how the best of the invisible builders will be anxious to leave the neighbourhood of cruel and destructive people, and how this rupture between devas and men would ultimately reduce the quality and richness of nature's gifts to those men, producing inferior crops and less favourable seasons. But when man takes the ripened crops for food, with thankfulness in his heart, then surely the devas are glad to be near him, to co-operate with him, and are pleased indeed to minister to his needs and his happiness, whether they live in the air, in the growing things, in the sunshine, or in the bountiful clouds and rain.

It must not be supposed, however, that man's efforts and knowledge do not count in the production of rich crops. On the contrary, they are essential. As a result of his study of the laws of nature, man has learned that what he sows he will also reap, that rice will bring forth rice and corn will produce corn. More than this he has learned, that if he tills the ground with right good energy, chooses the best seeds, plants them rightly in their proper season, and nourishes and protects his growing crops, his harvest is likely to be good, for he has obeyed the laws of Nature. It is because he respects those laws, because he reverences them, trusts them, has faith in them, that he has studied them, learned to know them, been willing to co-operate with them and spend his energy and time in working in obedience to them.

This is worship, whether the man knows that it is so or not, but to perfect his reverence and to complete his success, he must add feeling to his knowledge and his energy, and realise that all these things of Nature with which he works and among which he lives are things to be loved as living companions in a great creation of which he himself is only a little part. Thus he learns to work for the good and the happiness of living beings, taking his own good and happiness joyfully in exchange and happy in the consciousness that he lives in a world which is right for him, where there is no need for fear or anxiety so long as he does his own duty, which consists in study, love and work.

This great truth about the harmony of the devas with humanity is taught in the religious books, and people are reminded of it when they perform simple ceremonies to the devas, such as that of pouring ghee into the fire or of offering fruit and flowers on the shrine of Satyanārāyana. Truly there is only one Supreme Being, but of his ministers and those who do his will who can count the number ?

It must not be supposed, however, that human contact with the devas is confined to ordinary work connected with life's material necessities. The greater beings who are the ministers for different qualities, such as the minister of beauty, the minister of law, the minister of power and many another, reveal to us the divine qualities in the grander things of Nature, such as the beauty of the sky and clouds, the profundity of the ocean, the strength of the



THE HIMĀLAYAS, NEAR DARJILING

mountains, the purity of the Himālayan snows, and also in a wonderful perfection of detail, as in the nose of a mosquito (which contains a whole set of tools, including a borer, saw and suction tube), where we see the rare qualities of accuracy and patience. In a story told by a great Russian writer, there is an incident in which a man pays a visit to a goddess, and finds her bending very assiduously over her work. He asked her what she was doing and received the reply, "I fashion the

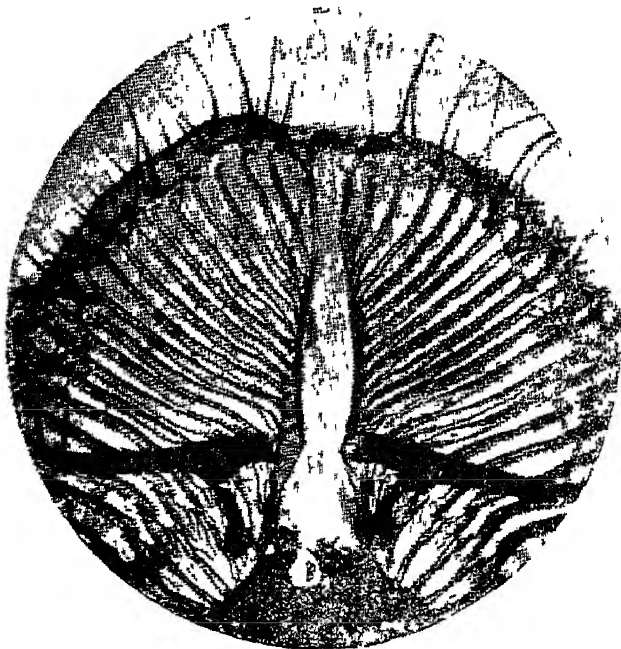
hind leg of a flea!" The pictures of a leg of a tiny garden spider and the nose of a fly illustrate this wonder of detail.

The wonders and beauties of Nature in the large form and in the minute are an avenue of approach to

the Supreme Being, who writes by the hand of his angels or devas the splendid lessons of beauty, strength, love, peace, joy, plenty and many other qualities in the magnificent book of Nature. Contemplation is the key to the language of this book, by which it is at once understood in the soul of man



FOOT OF A SMALL GARDEN SPIDER,
MAGNIFIED 400 TIMES



PROBOSCIS OF A BLOW-FLY, MAGNIFIED 60 TIMES

CHAPTER VII

MAN AND THE MINERALS

WE come now to what is called the unmoving creation. This term must be understood as meaning those things which are not organised, which have no organs or machinery within them by which they can move of their own impulse, without being pushed or pulled from outside. Man and the animals move according to their desires and will, and even the trees grow and make many movements by an inner impulse. Thus, for example, many of the plants which climb up trees and walls turn the upper surfaces of their leaves towards the light, while the tendrils which hold up the stem seek the dark crevices, though originally they also must have turned to the light, for they are themselves modified leaf-buds. But the clouds drift across the sky on account of the wind and the attraction of the mountains; the wind blows about because of the heat of the sun and the revolution of the earth; waves and tides of the sea are produced by the wind and the earth's turning, and by the attraction of the sun and moon. Even the mighty mountains and the earth's crust are very, very slowly rising and falling.

owing to changes in the interior of the earth, so that even the Himālayas were once under the sea. Thus everything in creation moves either slowly or quickly, but some move from within and others are moved from without. Even the animals and man are moved by many outward necessities, by the need of food, clothing and shelter, and by the attractiveness of objects, so that the difference between man and the mineral is only one of degree, not of kind. Only one being has perfect volition and does not act under the compulsion of outer forms, and that is the Supreme Being. Hence is God, often called Swayambhū, the self-existent or self-becoming, He who is dependent only upon Himself for life and action.

In this order of creation we find five great states of existence, all of which we class together as matter. They are the earthy, the watery, the fiery, the aery and the etheric or skyey, for which the ancient Sanskrit names are Prithivi, Apas or Jala, Tejas or Agni, Vāyu, and Ākāsha. These words cannot be translated into English without explanation, for in their scientific sense they do not mean simply earth, water, fire, air, and sky, but all things that are similar in nature to these. Prithivi exists for our use in the hard and soft forms of rocks and soil. The solid surface of the earth enables us to walk and run by resisting the pressure of our feet, and by its magnetic attraction (which we call the law of gravitation) it keeps us and our houses and belongings from floating

off into space like meteoric stones With its rocks we erect temples and other buildings, and with its softer soil, and its clay and lime, we make bricks and mortar for our houses From its depths we procure iron, gold, silver, copper and other metals from which we make girders for building roofs and large bridges, machines such as railway locomotives and other engines, gold and silver and other ornaments, copper vessels, and thousands of other useful things

Jala appears in the great oceans, in lakes, ponds, wells and rivers, clouds and rain, in oils and saps, in milk and blood. Agni appears when things are warmed and lighted up by the sun, as the cooker of our food, the ripener of our crops, the giver of light and warmth, the power within the engine of the railway train, the motor-car, the steamship and the aeroplane, that carry us and our goods about, in the lights that burn or glow for us at night, and in the furnace fires where we smelt and shape our metal and bake our pottery and bricks Vāyu is the air we breathe, the winds that cool us and bring the clouds over the land, and it converts the power of agni into motion in our steam and heat engines. Ākāśa is the ethereal anless sky, which gives us and all matter space in which to move, which is the seat of electricity and magnetism and light, and many other wonderful forces known only to the true rishis and yogis. It enables us to see, hear, feel and think, because it resides within the heart and brain. Indeed our

bodies are made up of these five things; they are sustained by them and work among them Such is



SOUTH INDIAN GIRLS

the kinship of man with the whole world Such has been the giving and receiving in life and death from immemorial times So may we have perfect confidence in the great goodness and benefit of Nature and of life.

CHAPTER VIII

CLOTHING AND SHELTER

DURING the course of long ages man has developed his body, so that it has become a delicate and sensitive instrument for his use, though hundreds of thousands of years ago man on earth was more like the lower animals, and his body was fit for rough usage and was a suitable instrument for the coarser life and work of those days. To do good writing we need a fine pen, not a bar of iron, which would be more suitable to poke a fire or make a hole in the ground ; we require a delicate compass needle on our ships to swing truly to the magnetic north ; and to weigh accurately in the course of a scientific experiment we use a sensitive chemical balance, not a railway station weighing machine. So does man require a refined and sensitive body for the gentle and cultured life of our civilised days.

In human life it is quality that is more important than quantity—size does not mark our worth, and even strength depends more upon the quality of our muscles than upon the bulk of our flesh. The tallest buildings in the world are made of steel

network, and some of them are nearly eight hundred feet high. It would be impossible to build to such a height buildings with walls of common bricks and mortar, however thick, for the bricks near the bottom would be crushed to powder by the weight of other bricks and floors and roofs above. Thus unnecessary weight is a useless burden and it is quality of material that is important, not thickness and quantity. The human body is now an instrument of very high quality, a delicate machine, a precious possession which ought to receive great care and attention. Many of the Purānas emphasise its value and the need for keeping it in good working order, and they state that he who has been so fortunate as to obtain one should guard it as his greatest material wealth, and use it to attain the highest objects of human life. A famous Western philosopher has similarly said, "Health is the first wealth," meaning by health a good condition of the body as regards its organs, nerves and muscles alike.

It has already been mentioned that food, clothing and shelter are important needs of the body, and pure air for breathing and good water for bathing must be added to these. Food and air have to do with the internal mechanism of the body; clothing and shelter with its protection from the outer world. Man is not well provided with clothing by Nature, and is not so strong in proportion to his size as many other creatures are, and this causes him to use his thinking

powers and his brain more than they do to overcome what are sometimes called the difficulties of his life. It is his destiny to develop his mind by use, and by this means he is taught to use it, instead of to rely upon brute strength in order to obtain what he wants. The brain grows and the mind develops by exercise, just as the muscles of the arm increase by being exercised with dumb-bells.

It is interesting to notice that little creatures like ants are much stronger than man in proportion to their size, for they often carry loads which are bigger and heavier than themselves, and animals such as horses, bulls, tigers and lions are each as strong as a great many men. A Belgian scientist has found out by experiment and observation that a crab can lift nearly five hundred times its own weight, and that a fly lifting a match stick was like a man lifting a beam of wood fourteen feet long and two feet six inches square, and he discovered also a tiny little insect which could pull six matches along.

One curious effect of man's independent mental development is his loss of what is called instinct. If we watch animals, birds and insects, we shall find that they instinctively do many things without being taught, and without knowing why they do them. They all know, for example, what foods to eat, but the human baby does not, and will try to eat pieces of wood and swallow coins and other little things if it is not watched. You will often see a dog turn round

several times before lying down—that action dates from the time when its forefathers had to trample down the grass in order to make a comfortable place, and the dog never understood why it performed that action and it does not now understand that it is no longer necessary. In countries where people have been cruel to birds they instinctively avoid human beings, but in India they come into our houses and schools and make nests in the rafters without fear. Spiders make wonderful webs; birds make marvellous nests, and some of them fly to distant countries for change of climate in the proper season; some ants breed and protect little insects called aphides, which they milk as we milk cows, and others deliberately sow and reap little fields of grain fourteen or fifteen feet in extent near their holes; and we have all seen the little clay pots which are made by builder wasps in the corners of our windows and doors, behind our books and underneath our tables, which the industrious insects sometimes line with little neatly cut leaves before they lay in them their eggs, and stuff into them caterpillars intended as food for the future young

But each man has to develop his own intelligence and he makes many mistakes in the process. The savage or primitive man is constantly being deceived by his senses, because he thinks that things are what they seem to be. He thinks, for example, that the earth is still and that the sun is going round it, whereas it is

relatively the other way about. To him a river or a lake seems at sight shallower than it really is. He thinks that the stars are small and near, yet they are thousands of millions of miles distant. So also it seems to a baby that the moon is near, and he tries to grasp it in his hands. Yet, when the mind of man is once developed, with its aid he can do wonderful things, which no animal with its accumulated hereditary knowledge can ever hope to do. These wonderful things will be the subject of later lessons.

Animals, birds, and insects are already provided by Nature with suitable covering, which serves for the three purposes of clothing—warmth, protection and beauty. Fur and feathers, scales and shells, have all their own uses. In cold weather for example, we see cats fluff up their fur so as to make it thicker and thus keep in the warmth of their bodies. Crows and other birds ruffle up their feathers and often when they settle down for sleep they make themselves look almost like feather balls. Some creatures have defensive covering, as the quills of the porcupine and the hard shell of the crab or the tortoise.

In other cases the protection given by their covering is of the nature of camouflage, making it difficult for them to be seen. Thus grass snakes are green, and exactly the colour of grass; the stick and leaf insects look exactly like withered leaves and twigs and they even dodder on their legs as though

swayed by the wind ; the chameleon changes colour to resemble the tree or plant or rock on which it stands ; butterflies look like flying flowers, with their variously coloured wings , the arctic hare and the arctic fox, which live among brown heather in summer, have brown fur, which changes to white when the winter snows arrive. One very curious example is that of certain crabs which live sometimes among seaweed and at other times among sponges. When among the weeds they plant pieces on their backs, by scratching the shell vigorously with their claws and then pressing the rootlets of seaweed into the rough places until they stick there. Thus they cover themselves with growing vegetation. But the most interesting point is that if one is removed from the seaweed and put among the sponges it will pull the weed off its back and plant sponges instead, or if it is moved from sponges to seaweed it will remove the sponges and plant the weeds. This creature has nothing that could be called a brain, and evidently works by a very strong instinct. Men need not hide themselves in any such way except in battle, when they wear khaki clothes the colour of the ground, and often cover themselves with leaves and branches of trees, and paint their motor-cars, aeroplanes, guns and other such things so that they look like shrubs in the distance. It may be noticed, however, that most men and women prefer the uniform or fashion of dress of their time so that they may not be

conspicuous The third object of clothing, that is, beauty, appears in the animal and vegetable kingdoms mainly for attraction, as in the case of the wonderful feathers of the peacock's tail, which are much appreciated by the peahen, and the brightly coloured flowers to which insects are drawn.

Very little clothing is needed for man in the plains of India, except in winter in the north, but warm things are required for the hills. Even then, the purpose of warm clothing is not so much to make the man feel warm as to keep the organs of the body at a normal temperature We often find, however, that people consider what is called a fashionable appearance more than comfort or health; for example, many men make the mistake of wearing hot coats and head covering, which become very uncomfortable and dirty This is not wise, for clothing should always be light, comfortable and airy, as well as tidy and clean. Bed clothing especially should be frequently washed, lest the body should absorb diseases while we are away from it during sleep.

Very little need be said in this lesson about shelter, but it should be emphasised that, like clothing, it ought to be adapted to the climate. We find animals using burrows and holes, such as the rabbit, the fox and the crab, nests are built by squirrels, mice, most of the birds and some fishes, lions and tigers prefer caves, while elephants are fond of the long grass. Some men in the past have lived in caves, in huts

made of leaves, and in underground hollows, but now they live in huts and houses. When we build our houses in India we have to think mainly of coolness, dryness, and good ventilation in the sleeping quarters. We have the problem of shutting out the blazing sun and admitting as much as possible of the precious cooling breezes. The ideals of the cultured and educated people of India have never been to have gorgeous private houses. Here again quality is more important than quantity. Houses should be simple, comfortable and convenient, with good floors and roofs, and especially good bathing and kitchen arrangements, and the residential part should be ornamented with beautiful carved doors and beams, not with cheap and gaudy plaster work. Gorgeousness was always left to the palaces and public buildings, which were intended largely for show, and personal grandeur in this matter, as in that of clothing, was always considered unworthy of a wise and sober gentleman.

CHAPTER IX

PLAY AND WORK

WHEN food, clothing and shelter have been provided, man still needs active exercise for his body, and mental 'food' and exercise for his mind. In these modern days we have so perfect a means of getting food, clothing and shelter that only part of our time is taken up in working for them, and when the day's work is done we still have leisure and energy for other things, unless we are very unfortunate. Thus there are for most people spare hours in the day or at the end of the day, and spare days at the end of the week, as well as occasional holidays; and a good part of this spare time is generally given to what is called play when we are speaking of young people and recreation when we allude to elders.

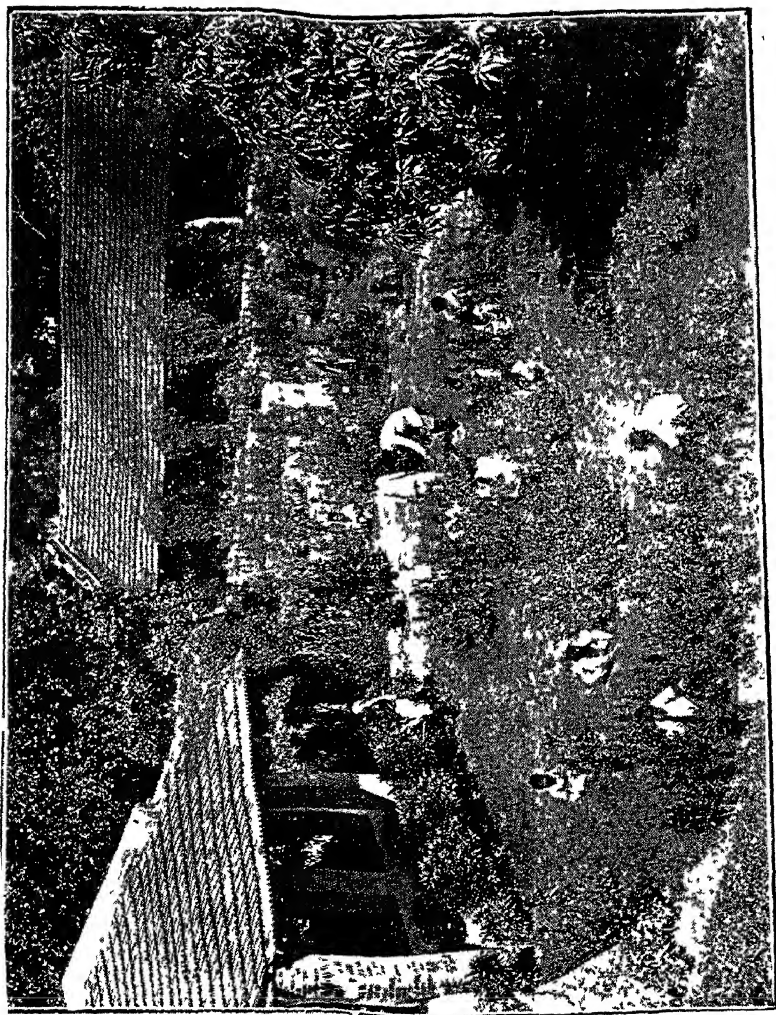
The characteristics of play are two. It gives us the pleasure of using our power and enjoying healthy sensations, and it stops short at the point when fatigue becomes uncomfortable. The delight of riding a good bicycle, for example, gives us a feeling of added power, which comes from the smooth and swift gliding motion, and the exhilarating sensation

of air rushing past and objects flitting by, together with an enhanced glow of life in the body on account of the healthy vigorous exercise. If we are tempted to go a long distance we may become very tired on the return journey; then all pleasure disappears and we only wish that we were back at home. It is no longer play; it is drudgery, if we have to continue making efforts beyond the point of healthy tiredness. Walking, running, jumping, swimming, singing, bari, and various kinds of ball games such as cricket, football, tennis, badminton and golf, are all favourite forms of play; they give us the pleasure of using power and skill, enhanced by a healthy physical glow, unless they are overdone. It is a good rule, in play as in eating, to stop before we are fully satisfied. All creatures that are not by nature sluggish, and are not overworked or underfed, share with mankind this delight in play, which is so necessary for the health of the body that two or three hours should be given to it each day. We see young lambs and calves frisking about in the fields, and hear the birds enjoying themselves with song, and those who are familiar with wild monkeys will have noticed what delight they take in chasing one another among the trees and gambolling together on the ground, pulling, one another's tails and jumping and leaping over one another's heads.

Recreative play is especially necessary for those who are deeply engaged in study, which tires the

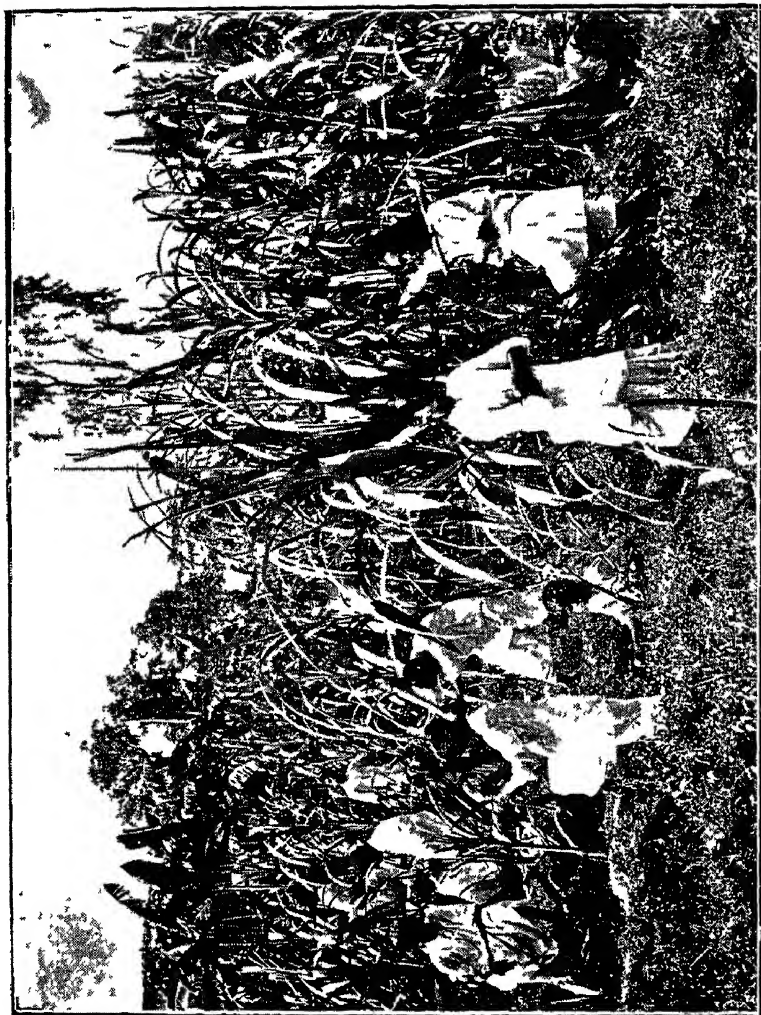
eyes and nerves and leaves the muscles weak and flabby ; and it is wonderful how great is the benefit to brain as well as body when there is sufficient play. In South India for several generations boys and young men have not played enough, being too intent upon study ; but we found at the Madanapalle College, where many people thought that we gave too much time to games, that the brains of the students were so much brightened by the flow of good blood resulting from healthy exercises, that in less time and with less effort than usual the students achieved rare success in their studies, and shone brilliantly in the University examinations.

The brain as well as the body requires recreation, especially when both body and brain are tired owing to ill-balanced living, and under these circumstances good recreation can be obtained by reading stories and good novels with some emotional interest of love or adventure, and by playing indoor games such as chess. So much was thought of chess in the middle ages in England that it was considered an essential part of the education of every youth of good family. But games such as cards should be rigidly avoided if we find that they tempt us, beyond the limits of due recreation, to waste time that ought to be spent in study, work or healthy outdoor recreation, or in other duties. This warning is necessary, when many people are led to waste precious hours, because games of chance create unhealthy excitement, even when



SCHOOL BOYS GARDENING

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School Boys sending Sugarcane

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they do not lead to gambling ; which is not the case with games of skill, such as chess.

Great pleasure is to be found in what are called hobbies, all of which imply more or less art and skill. Music, poetry, painting, modelling and chiselling, mechanics, fretwork, wood carving, lace work, gardening, the collection and arrangement of natural specimens such as rocks, shells and dried leaves, the direct study of the habits of birds, insects and animals—all give a delightful expansion of experience and knowledge, if not carried beyond the point of fatigue.

In an ideal life work and recreation would become all one, as all its details would be well arranged, there would be no hurry or strain, and each detail would be interesting because of its relation to the whole. Few people have the opportunity to organise their work in this way, so that it would never be carried beyond the point of fatigue, and would never become monotonous, because it would always be full of skill and progress.

It is very important that we should not spool our play by taking it too seriously and being ambitious in it. An instance of this is the growing feeling that music in the home is generally so much inferior to the professional music of the public concerts that it loses its attraction. But really the music and singing of those we love at home is far more restful and pleasant than that which our critical faculty so much approves in the concert hall, though it may be very



A MODERN GAME—HOCKEY

far from perfect. The game of cricket is another example ; as long as boys play with a ball and bat on any piece of ground that is available there will be pleasure, but the joy often goes when they become ambitious and spend their energy in worrying for a perfect field (which few can have) of the dimensions and kind prescribed by the professionals who make a work of the game.

CHAPTER X

TYPES OF MEN AND THEIR FOOD

ANIMALS, men and other creatures desire happiness, but what that happiness is depends entirely upon the nature of the individual concerned. Some are sluggish, and much enjoy sleeping and dreaming their time away; others are full of activity in their pursuit of pleasures of the senses; others again find their enjoyment in the search for knowledge, happy companionship with family and friends, or a life of active public work. In a school, for example, some boys or girls are lazy and take no interest in either outdoor games or study, others are fond of play and neglectful of their books, others again are studious and have but little liking for active physical games. Each one is following the thing which gives him happiness. But they do not know what it is that would give them the greatest happiness; they are following what seems to them to do so. Therefore wise men have called many of these pursuits pleasures, having distinguished them from real happiness, and they have told us that these things called pleasures are followed by beings who are

tāmasic or sluggish, and those who are rājasic or full of restlessness. Only those wise men who are sātत्वic, whose energies are strong but self-controlled and guided by wisdom (that is, by knowledge and love) are on the road of true happiness.

Men in whom this sātत्वic nature predominates are often said to be becoming god-like, for it must be remembered that the very nature of God is ānanda, or happiness, and this happiness is to be found in the activity with which God creates the world, the love with which he sustains it, and the law and order with which he determines its course and the adjustment of its parts. The question has often been asked why God created the world, and some great Christian devotees have said that God is full of love, but as love cannot exist without some object of affection, he created the world, of beings so that his love should flow out upon them. A still fuller answer is given in the life of Shri Krishna recorded in the *Mahābhārata*, the *Shrimad Bhāgavatam* and other works. He, as representative on earth of Brahman, is full of vigorous activity in well-doing, full of love and knowledge of what is best; and when the question is raised in the *Bhagavad-Gītā* he replies that there is no need for him to mingle in a world of action on account of any duty imposed upon him, or anything that he could possibly gain. He created the world of beings, and sustains and manages it according to law, because if he did not do so it would fall into

confusion and ruin, and the progress of living beings would come to an end. Here we find the divine bliss or happiness expressing itself in creative activity, in love of beings, and in law and order. Thus the happiness of the sâttwic or god-like man is found in creative activity or productive work, love for all beings, and knowledge of the laws of life. These three kinds of happiness are permanent. To give only one example, the painter or sculptor never tires of his work, but the pleasures of eating and drinking soon die away, and if much sought after soon change to pain.

Animals seek food, and men seek clothing and shelter also, not only because these things are necessary, but because they give pleasure. Food is very satisfying to the hungry body, and sometimes it is highly tasteful. For the satisfaction of hunger the tāmasic creature is made to exert himself in the search for food, but when he has stilled his appetite by eating he likes best to go to sleep until hunger moves him again. The rājasic nature is more highly developed. After much experience he has developed a keen memory of the pleasure of eating, so he seeks food not to satisfy his hunger but for the pleasures of taste, and when his appetite is satisfied he will seek to stimulate it again by strong spices. He lives for the sake of eating. But the sâttwic man eats for the sake of living; he knows that taste is a pleasure that soon passes away, and he has come to find his

happiness in the productive work by which he has earned the right to eat. The pleasures of the senses are intended to tempt the sluggish soul into making efforts, and only after some time will the lesson be learned that it is the effort that is joyful, not the pleasure which it at first mistakes for happiness. While the seeker of food is learning to be active and useful, he is also learning to use his mind, to think, and when he becomes a sâttwic man he rejoices also in a knowledge of the laws of life.

The ancient books give the following list of foods for the three types of human beings

Sâttwic foods that augment vitality, energy, vigour, health, joy and cheerfulness, which are delicious, bland, substantial and agreeable, including wheat, rice, barley, milk, ghee, sugar-candy, butter, honey, dry ginger, cucumber, various vegetables and beans and good water.

Râjasic foods that are bitter, sour, salty, very hot, pungent, dry and burning, and which ultimately produce pain, grief and sickness; including sesamum, mustard, liquors, fish, flesh of animals, curds, buttermilk, gram, oil cakes, assafoetida, garlic, betelnut and leaves, tamarind, chillies, etcetera.

Tâmasic. That which is stale and flat, putrid, corrupt, leavings and unclean.

In the matter of clothing and shelter, the tâmasic man seeks ease, comfort and luxury. He does not like to walk when he can ride; he is very fond of

soft pillows and beds, and unless he is rich and surrounded by servants these things, like his own body, will be far from tidy and clean. The rājasic man is full of show and pomp ; his clothes and houses are rich and impressive, and his manner is self-assertive and even arrogant.

The sāttwic man knows that his body is but an instrument with which the soul works, just as a musician plays upon his vīṇā or as a boy rides upon his bicycle. He gives it the comfort, the nourishment, the exercise and rest that it needs, looking after its health and condition as one would after that of a splendid and valuable horse, and in return he expects it to serve him well in his pursuit of the true ends of human life—work, love and knowledge.

We must not forget to mention at this point that among animals and plants, as well as men, even in the case of those who are tāmasic and rājasic, love of offspring appears, and induces them to labour for the food and shelter of the young in many ways, and for their establishment in life, as we shall see in the next lesson.

CHAPTER XI

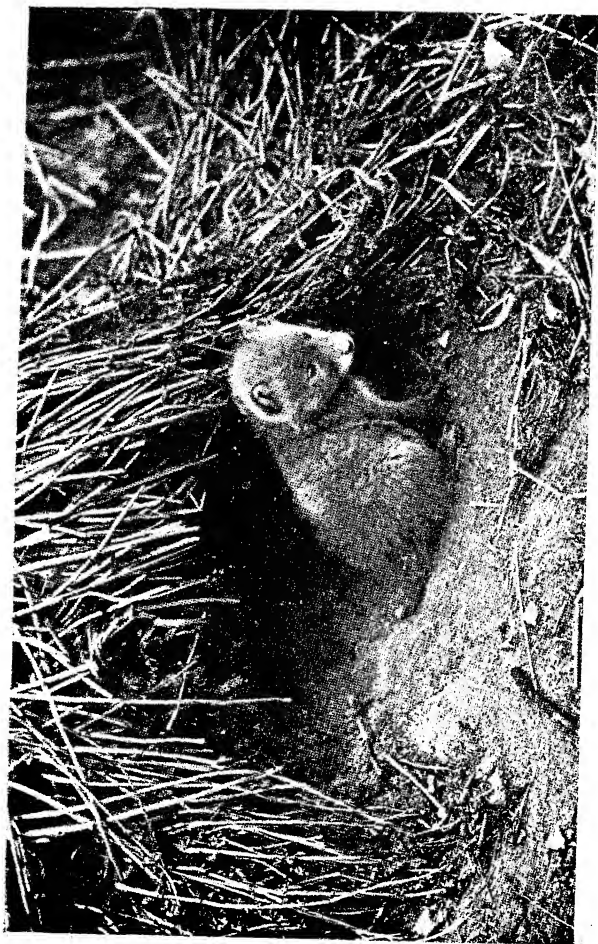
FAMILY LIFE

It is useful for us to notice at this stage of our study how frequently love of family appears in the animal kingdom, and how important it is for the preservation of the various species. If it were not for the attraction between father and mother nearly all the higher wild animals, such as lions, tigers, wolves and elephants would soon disappear from the face of the earth—and if it were not also for the care that they take of their offspring while they are still too young and weak to take care as themselves. The same principle is true in the case of mankind, and it is sometimes considered a religious duty to bring into the world one son and one daughter if one has a healthy body and good ancestry. It is, however, desirable in the interests of the nation in which we live, that those who have had diseases such as consumption and leprosy should remain single and without children, for such diseases are passed on to the children and are spread by contagion or infection to other people with whom they come in contact. It



Bird feeding young ones

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"I do wish mamma would come."

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is desirable also that marriage should take place at a ripe age, for science has proved that the children will be stronger and brighter than those born of parents who are very young

It has been said that there are few things in life which can do so much to improve the minds and hearts of a woman and a man as the effort to make themselves a centre of helpfulness and joy to a family of growing children, and certainly it is one of the things that all who are strong can do for the benefit of their nation and of humanity. It is not difficult to see how it can bring out the best in man and woman. For example, the ambitious rājasic man, whose great desire in life is to push himself into prominence and shine out superior to his neighbours, if not by merit, then by pulling down those who are climbing near him, either by evil tongue or otherwise—though he desires to excel all others, yet wishes that his own son should rise superior to himself. It may be said, indeed, that the greatest wealth a man and woman can have is a family of really good children, and one of the best things a boy or girl can do is to try to achieve the goodness and progress that his parents desire for him, for his own sake as well as for their happiness. Children carry on the family into the infinite future, while most of the other works of man entirely perish; and the parents of good children in their old age have the extreme happiness of feeling that their lives have not been in vain.

A family life similar to that of man is often seen among the lower creatures. Animals such as the lion, tiger, bear and wolf, most of the birds and all the higher monkeys and apes take only one wife or husband. An interesting account is given, in one number of Mr. Bibby's excellent Annual, of the housekeeping of the higher apes of Borneo. The father, with careful and far-sighted industry, builds a snug home among the branches of a lofty tree, and there establishes his wife after paying court to her, and in due time their offspring come into the world. Then, with touching fidelity, he himself descends the tree and sleeps on the ground, ready to fight any foe who may try to climb up and molest his family. This pair remain united for life, and are attached to each other with almost human devotion. In the same article it is said that the Chinese people, in their marriage ceremonies, pay special reverence to the goose, because it is strictly monogamous and mates for a whole lifetime.

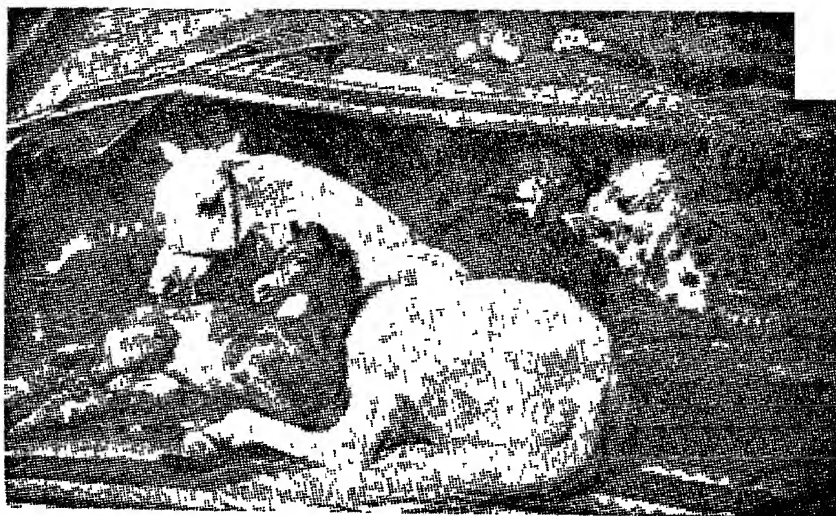
Another interesting case is that of the salmon. The father fish comes up the stream first, and forms a kind of nest among the pebbles and sand. Then the mother arrives and deposits her eggs in the nest, after which the father adds his fertilising element to the eggs. Then the two spend their time in close companionship, and together take care of the young. This case is taken to show that association for the care of the young is a very old instinct.

In the animal kingdom this tendency to family love often extends itself to the herd or the flock, and there are many cases of special friendship involving mutual help. One of the most interesting examples is that of the cranes and the larks. When the cranes fly across the sea for change of habitation they allow larks to accompany them, and sometimes the small weak bird has been seen riding on a crane's back when tired. We have all seen birds standing on the backs of oxen and relieving them of troublesome flies while getting a good meal for themselves, and a funny example of the same kind is that of the friendship between the rhinoceros and a little brown bird which always lives and rides about on his back when not engaged in building her nest and looking after her young. It happens that the rhinoceros cannot see very well, as his eyes are small and deeply set in his head, and their vision is obstructed by the large horn near his nose. So in time of danger the little bird with her keen sense of sight soon gives a warning cry, and if the old fellow is asleep she catches hold of his ear with her beak and pulls it till he wakes up and attends to the pressing business of the physical world.

In this section of our study we ought to have learnt that as citizens of the world we must recognise the co-citizenship of other living creatures, and act towards all in a spirit of kindness and comradeship. The following verses show the true attitude of mind :

If you sit down at set of sun,
And count the acts that you have done.
 And counting, find
One self-denying act, one word
That eased the heart of him who heard—
 One glance most kind
That fell like sunshine where it went,
Then you may count that day well spent.

But, if through all the live-long day
You've cheered no heart by yea or nay,
 If through it all
You've nothing done which you can trace
That brought the sunshine to one face,
 No act most small
That helped some soul and nothing cost,
Then count that day as worse than lost.



PART II

WHAT MAN CAN DO

12. Physical Specialties of Man.
 13. What Man can do with his Brain.
 14. What Man can do with his Hands.
 15. The Use of Tools and Machines.
 16. The Use of Engines.
 17. Appreciation of Beauty.
 18. Music and Poetry.
 19. Speech and Writing
 20. The Dignity of Work.
 21. Do it Well.
 22. The Expanse of Human Affection.
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CHAPTER XII

PHYSICAL SPECIALITIES OF MAN

DURING the last century scientists in Europe have paid a great deal of attention to the comparison of human and animal bodies, and have conclusively shown that all the features of the human form are to be found also in animal bodies of one kind or another. The form which is nearest in structure to that of man is the body of the monkey,



PROBABLE APE-MAN FAMILY

and especially of the highest types of monkeys, which are called manlike apes, such as the chimpanzee, the orang-outang and the gorilla. Anatomically, man is the same as the ape, bone for bone and muscle for muscle.

It has therefore been concluded that man and the ape had a common ancestor, from which both have developed, just as one road may branch off into two going in different directions. This does not mean that the vulgar notion that man has descended (or ascended) from the ape is correct, and as a matter of fact the difference between the lowest man and the highest ape is too great to admit of the possibility of one being the direct descendant of the other, and the course of evolution (or unfoldment of powers and qualities) of the individual ape shows us that the ancestor from whom they have descended was more man-like than themselves. The individual ape is more human when young than when older ; when it is young it is intelligent and good-natured, but as it grows it becomes more stupid and its skull begins to recede, while its facial bones and jaws develop, producing a far more animalised being, both anatomically and mentally. With man the reverse is the case, for as he advances in age he develops his intelligence, expands the upper and frontal part of the brain, and becomes more and more human and spiritual. Individual development is the key to the evolution of ancestors, and we may well conclude that the apes have really made a descent while we have made an ascent from our common ancestor.

The ancient books speak of man as the 'straight-backed,' while the animals are called the 'sloping-backed,' and this is the fundamental bodily distinction between man and the ape. A second distinction is to be found in the important fact that man has a far larger brain, and here there is a great gulf between the two, for the brain of the highest ape (the gorilla) has a capacity of only thirty to fifty-one cubic inches, while that of the Australian aborigine (almost the lowest type of man on earth) amounts to over ninety-nine cubic inches, or roughly three times as much. Even the newly-born human baby has a brain twice as large as that of the full-grown ape. All other animals, such as the elephant and horse, have brains still smaller, and there is nothing in nature to fill the huge gap between the ape and the human brain, nor in any old skeletons that we have been able to find. The oldest known human skeletons have been lying in the earth for at least a lakh of years, and they show no special similarity to the ape type of brain, and their skulls are no nearer in shape or capacity to that of the gorilla than are those of many men who live at the present time.

Another distinction lies in the hand, which is the most perfect working instrument in nature. The ape is considered to be highly favoured in this particular, for it has hands, while all other animals have to do their work with less adaptable instruments. The bird has to use its beak for building its nest as well as for taking in its food, the elephant has to use its

long nose for lifting objects, nearly all creatures are restricted as far as constructive work is concerned to the use of their jaws. With such instruments only the roughest of creative work is possible for them, and the use and development of tools is an impossibility. Although the monkey shares with man the privilege of the hand, there is here again a great difference, for man has a useful thumb, placed in opposition to his fingers for grasping and holding purposes. If you look at the hand of an ape you will see that it has but a tiny, weak and almost useless thumb, far down near the wrist, and placed in a line with the fingers, not in opposition to them. Among men, indeed, the size of the thumb in proportion to the length of the hand marks out character, will and intelligence, and a man can really be judged by the measure of his thumb.

It must be clearly understood that the quality of the human body is entirely superior to that of the apes; it is altogether more refined and sensitive. This is to be seen in the texture of the skin and hair and in other particulars, and has something to do with the fact that man has a more perfect instrument for speech. The shape and mobility of the lips and mouth, the flexibility of the tongue and of the vocal cords in the throat, under the control of the will, help man in the expression of his thoughts and feelings through language. Articulate speech is one of the supreme powers of man; far beyond the ability which the apes have, like many other animals, to express their feeling by inarticulate sounds. These

then are five of the main physical features of human distinction and superiority. the erect posture, the large and well-shaped brain, the hand with its



A BENGALI GENTLEMAN

useful thumb, and the mouth and throat organs
required for articulate speech

CHAPTER XIII

WHAT MAN CAN DO WITH HIS BRAIN

WE have distinguished five physical specialities of man—his erect posture, his brain, his thumb, his sensitive nervous system and his organs of speech. These are all organs which have come into being to express the developing powers of the human soul. Just as the human hand will shape iron and wood into the forms of chisel and hammer, so that it may afterwards hold them and use them as tools or instruments to increase its power, or as it will form out of cane a flute on which the lips can play sweet music, so has the human soul in the course of ages gradually shaped out of the matter of the body the brain, the thumb, the nerves and other instruments or organs that it needs for its use, and for the expression of its will, its thoughts and its feelings.

This fact is expressed in the scientific phrase 'function precedes organ'. The function of the mouth is partly to speak, and the function of the legs is to carry the body along by pushing against the earth. Yet it is not because we have a mouth and legs that we are compelled to speak and to walk ;

but because we had a desire to express ourselves and to move about we gradually formed these organs for the purpose. The primitive creature has the functions, but not yet the specialised organs; when it wants to move it puts out a foot, and when it wants to eat it makes a hole in itself near the piece of food, so as to take it inside. The function is there, though the organ is not yet specialised. It is by the pressure of will and ideas that bodies with their organs 'like all machines' have been made

The brain is the instrument of thought, and man's development and use of this organ is seen in his three superior powers: (1) to acquire knowledge, (2) to store it up in his memory, and (3) to apply it. You will find that most men who are not idle are engaged in at least one of these activities. There are the Scientists, who study the different kinds of matter and objects in the world and the forces which move them, who have discovered most wonderful things, such as the weight of the earth, the size of the sun, the distance of the stars, how human and animal bodies are made up, and what functions are performed by the blood, bones, skin, nerves, lungs, heart, and nearly all the rest of its parts, how to use the powers of fire, steam, electricity and ether, and many other things. There are the Psychologists, who study thoughts and feelings in order to know about man; and the Philosophers and Sages, who study the science of life and the unity of all things.

There are the Authors of books, Teachers and Lecturers, who are concerned with the storage and the spread of knowledge. There are the Inventors, Architects, Artists, Builders and Manufacturers of all the lakhs of useful and beautiful things that mankind has been able to create. These last are concerned with the application of knowledge

Each one of us finds himself able to exercise the four qualities of thought (1) to discriminate one object from another, as a door from a wall (chitta); (2) to recognise the quality that belongs to an object, such as sweetness pertaining to honey and fluidity pertaining to water (ahamkara), (3) to hold these objects and qualities before the mind's eye or in the memory while comparing them (manasa); (4) to deduce the unseen from what is seen or the unknown from what is known (buddhi), as when one judges that there is a man round the corner because his shadow is seen, or that a stranger has come walking from a distance because he has much new dust upon his clothes and his feet. The mind working as a whole, as though it were a sixth sense-organ, also unites the various sense impressions, as when we know an orange we think of its colour, roughness, shape, size, weight, taste, etcetera, all in one

The developed mind gives man new power of enjoyment, for he can sit down and think about the past and future. He has memory, so that he can mentally recall pictures of what has happened in his

life, and he can judge what is likely to happen in the future. Thus a boy or girl can enjoy over again in his mind a pleasant journey or pilgrimage, a musical party, or a game, and can enjoy in anticipation the pleasures which are to come next week or next year.

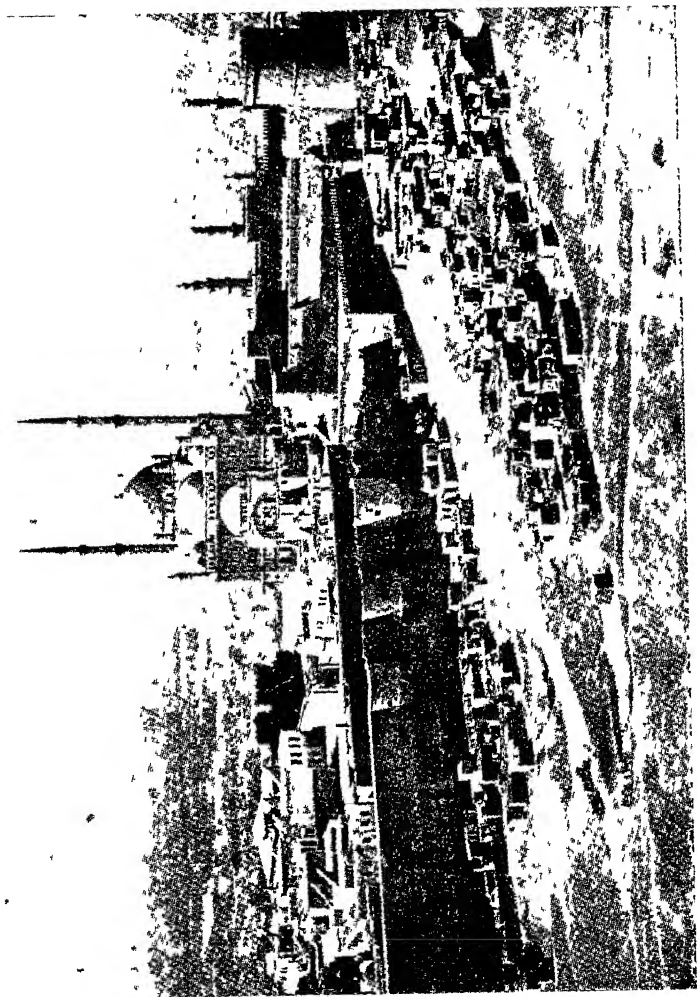
The mind is thus a great power and, as it can be used for wrong as well as right, it is dangerous, like a knife, which is a very useful tool, but may do great injury in wicked or careless hands. A small boy who has a knife to sharpen his pencil may cut his own finger or injure his neighbour; so a boy who is fond of food may remember the tasty objects when he is not hungry, and be thereby tempted to think too much about eating and thus to stimulate himself to overeat and to make himself ill. Animals in a state of nature are generally saved from that danger, because they are moved to eat by the needs of the body, not by the stimulus of thought. In the same way a wicked man may be worse than a tiger in cruelty, because he uses his mind to injure. No animal hunts for the pleasure and excitement of killing, unless like the hunting dog it is taught to do so by misguided man. When men make the horrible mistake of going into battle against each other they use their minds for mutual injury, and they do not fight with natural weapons as bulls with their horns, but they make frightful guns and bombs, torpedos and shells of gas, and many other almost incredible instruments of destruction. Yet there is no height

that man cannot attain by the right use of his mind.

One ship drives East, and another drives West,
With the selfsame winds that blow ;
'Tis the set of the sails and not the gales,
Which tells us the way they go

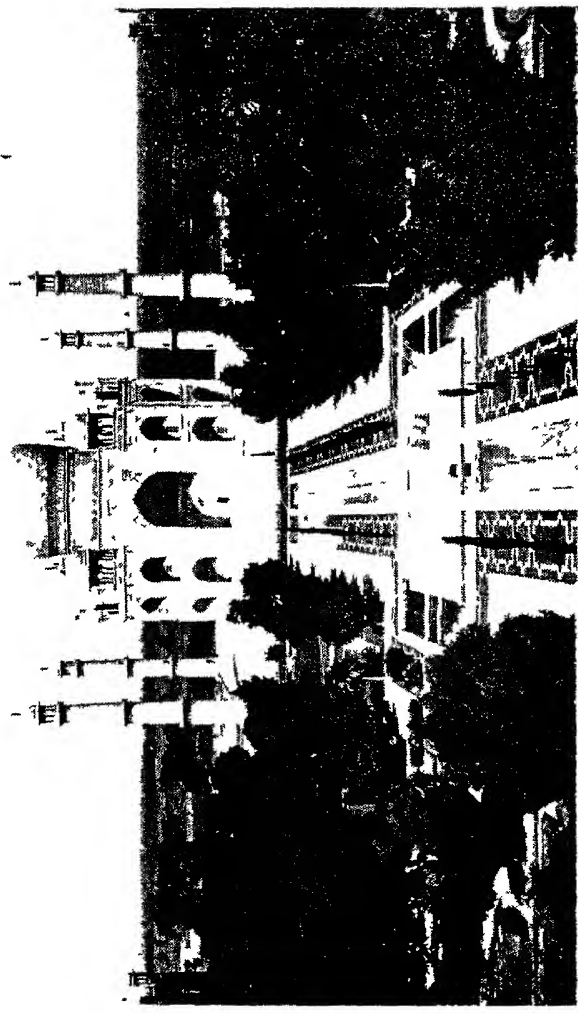
Like the winds of the sea are the ways of fate,
As we voyage along through life ,
'Tis the set of the soul that decides its goal,
And not the calm or the strife

WILCOX



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THE CITADEL, CAIRO



THE TAJ MAHAL

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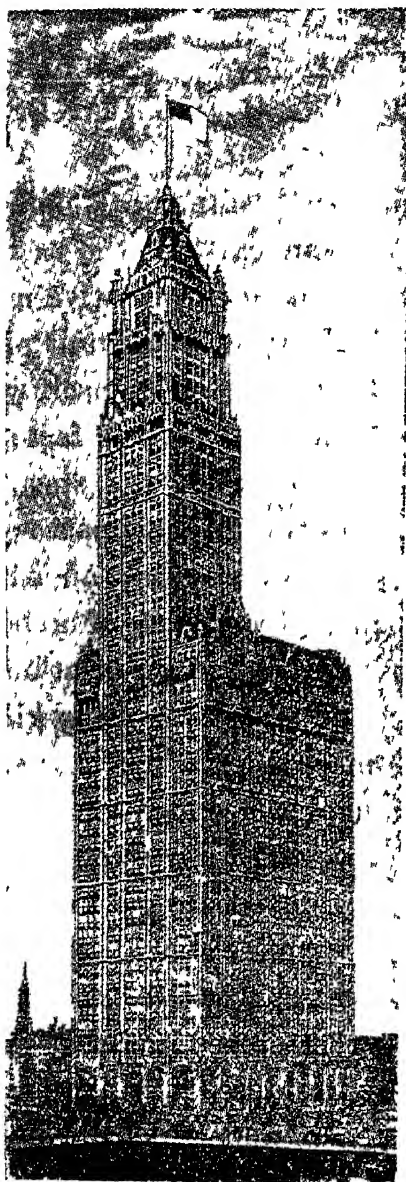
CHAPTER XIV

WHAT MAN CAN DO WITH HIS HANDS

MAN, served by his unique hand, stands pre-eminent among all the creatures of the earth as the user of tools and machines. Even the most primitive man, who lived in caves in the immeasurably distant past, long before the discovery of iron, armed himself with a stick, on the end of which he used to fasten a sharp flint stone so as to form a rude axe, spear or knife; and somewhere far in that archaic past some one made the wonderful discovery that an arrow could be flung to a distance by means of a bow, which must have revolutionised the civilization of those times. Nowadays we find man using many kinds of wonderful tools and machines, which increase his power because they make use of the forces of Nature. Ancient man, however, did not regard the invention of tools merely as a fortunate discovery, as we do to-day, but looked upon them always as a revelation by the divine beings who are superior to man, who generally keep themselves invisible—this revelation being either by the descent or avatāra of a divine man come to teach and guide, or by an inspiration into the mind of one who has prepared

his brain by much thinking about the subject of discovery.

The most imposing monuments of man's manual



WOOLWORTH BUILDING, NEW YORK

skill that remain to us from past civilisations are the giant buildings in which men have always gloried. Among the most striking of these are the Pyramids of Egypt, and especially the Great Pyramid at Gizeh, near the river Nile, which is thought by some to be about 5,000 years old, by others some 20,000, and by others again no less than 78,000 years, the last estimate being based upon an astronomical calculation of what are called Siderial Years, or years of the stars as distinguished from years of the sun. This huge structure contains more than two and a quarter millions

of stones, which weigh on the average two and a half tons each, and are neatly squared and fitted together with such marvellous accuracy that it would be impossible to push a knife-blade between them, as there is a space of only one five-hundredth of an inch. Some of the stones are between forty and fifty tons in weight, and the shaping, lifting and placing of these huge masses represents a splendid human achievement, especially when we consider that the whole structure is nearly five hundred feet high. Not far from the Pyramid stands that giant statue, the Sphinx, which has the head of a woman and the body of a lion, and is carved out of living rock.

In contrast with these we have the new giant buildings of America, which are sometimes called 'sky-scrapers' (a very ugly name) on account of their height. One of the biggest of these is the Woolworth Building in New York. This huge steel structure has forty-six floors, one above another, and rises to a height of nearly eight hundred feet—as tall as ten good coconut trees standing one on top of another. Such buildings would be almost useless if it were necessary to climb up many hundreds of steps to reach the upper rooms, but they have inside little rooms called lifts which move in a shaft and rapidly carry us up and down.

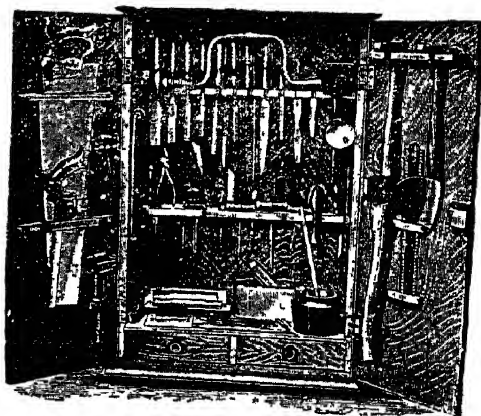
The most beautiful building in the world is the Tāj Mahāl at Agra, built nearly three hundred years

make what is useful, but also to impress his ideas upon outward form and express his sense of what is beautiful.

CHAPTER XV

THE USE OF TOOLS AND MACHINES

It would have been utterly impossible for men to build those wonderful structures that we have described in the last chapter had it not been for their knowledge and use of tools, machines and engines. It would have been impossible, for example, for the masons of South India to put in place the huge stones of the temple walls without the aid of a crowbar, which is simply an iron rod used as a lever. With such a rod about four feet long stuck about six inches under the stone, a man can lift and move to the extent of a few inches a stone that could be lifted only by seven men without crowbars, so it will be seen that twenty men



SET OF CARPENTER'S TOOLS

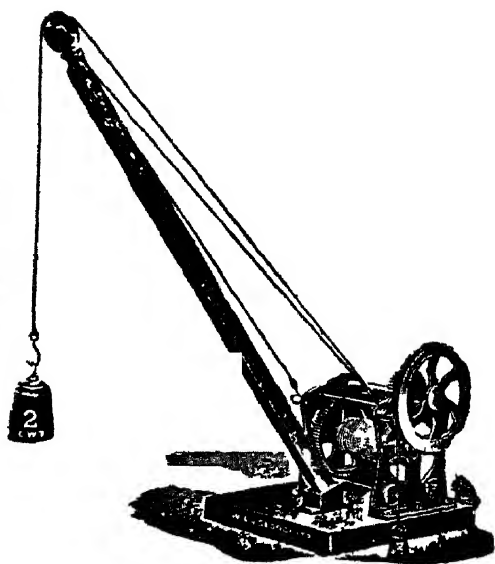
with these levers could easily move into place a stone weighing much more than seven tons. To

lift the biggest stones to a height of several feet the old workmen must have dragged or levered them up slopes or inclined planes, or up a series of supports or steps.

The lever is an example of a tool for lifting purposes. For cutting purposes we have the knife, saw, axe, and chisel. All the force that you give by pressure upon the handle of a knife reappears at the edge of the blade, and so concentrated along a fine line it exerts great power. With the saw the whole force of your push or pull reappears at the teeth, and the force of your thrust or throw is felt at the edge of the axe, while the chisel driven by the blow of a hammer gives a more delicate form of axe work. A tool for holding, where our fingers are neither hard nor strong enough, is the pliers, working as a double lever and much increasing thereby the force of our grip. Scissors are almost the same as pliers, but they have a fine edge so as to cut through the substance, instead of merely to hold it. The bicycle spanner is also a grasping tool, whose jaws are held by a screw instead of by the hand, combined with the principle of the single lever.

The long-handled thrusting spade is a double tool, which acts as an axe or knife when thrust into the soil, and then as a lever for dislodging the spade-full of earth. The short backhanded spade has only the first of these virtues—it cuts into the soil, and then the load is generally simply lifted, not levered

out. The curved pick is also a double tool, having a sharp point instead of an edge, and a curved head which is rolled over as a lever to dislodge the hard soil or stony matter after the point has been driven in. Allied in principle to the lever we have also the oars of a boat.



A DERRICK CRANE

Pens, pencils, paint-brushes, stylos, and the little tweezers used by printers for putting their type in place, and musical instruments such as the whistle, flute, harp, vina, sitar, violin and trumpet are also tools, not in this case used for the application of force, but for the delicate and peculiar effects required for such operations as writing and drawing and the production of beautiful sounds by touch and breath.

All such instruments held by the hand are called tools; but we have two other kinds of instruments which in modern English we call machines and engines. A machine is generally more complex than a tool, but its special quality is that it has a support of its own and is not held by the hand. A familiar,

example is the wheel that is used for drawing a bucket of water up a well. The rope and the wheel together constitute a machine, and the advantage that they give is that you have not to lift your own weight when raising the water. If you had to walk down steps to the water's edge for every potful and then carry it up the steps, you would have to lift your own weight each time as well as that of the water. When builders fix up a wheel and rope on the top of a wall, and draw up buckets and baskets of bricks, stones and mortar, they save very much work which would otherwise be spent in climbing up ladders and steps, and very much time also which would otherwise be occupied in going up and down. It would be a terrible task to carry materials to the upper floors of a structure like the Woolworth Building in New York; only machines called pulleys, made by an arrangement of several wheels instead of only one, have rendered such a work practical.

Other machines are the potter's wheel and turning table, the hand-loom for weaving cloth, the system of wheels under a cart or carriage, a picotah, a bicycle, a pump, a pair of scales, a screw press, a typewriter, a door on hinges, a clock, a watch, a punkah fixed to the ceiling—and many others. Musical instruments such as the piano, organ and harmonium also belong to this class.

Thirdly we have engines, which are machines supplied with power, such as the expansive power

of steam in the railway engine, the explosion of gases in the motor car, the movement of magnets by electricity in the electric tramcar and the electric fan. About engines operating machines we shall learn something in the next lesson. Here we will notice merely one example, referring again to the power required to lift materials to the upper part of the Woolworth Building. To pull weights up, even by means of ropes and pulleys, would be a very heavy task, so a steam or gas engine is pulled up in parts and put together on a platform at the top of the building, being raised from time to time as the work progresses. It then revolves a wheel which winds and unwinds the rope with a power as great as that which could be exerted by hundreds of horses pulling hard. This engine is called a derrick-crane.

CHAPTER XVI

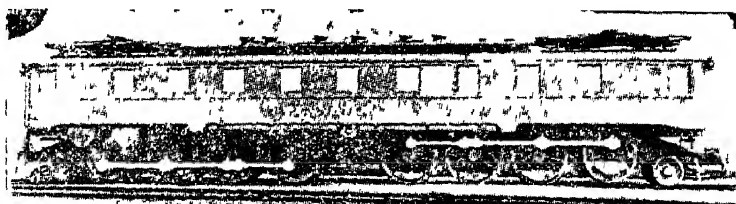
THE USE OF ENGINES

As man has gradually perfected the work of his hands, and carried it out with an ever-increasing knowledge of the world of Nature about him, he has made himself a traveller in all the four regions of life on earth. No bird can fly so high, so swiftly or so far as he, nor remain so long on the wing; even the swiftest horse is left behind in the distance by his rushing trains and cars on rails and roads; no worm can burrow into the earth as deep as he does in search of gold or minerals, or make tunnels through mountains and under rivers; and the fishes of the seas are puny and weak beside his steam-ships that plough the ocean surfaces, and his submarines that explore their depths. Man has made alliance with the powers of earth, water, fire, air and ether (or sky, for ether is the matter of the sky), understanding them with the aid of his brain, working with them with the aid of his hands.

If a visitor were to fall upon earth from a distant planet nothing among the works of man's hands could strike him more forcibly than those travelling

machines which make man master of earth, air and sea. The steam locomotive or railway engine has been with us now for nearly a hundred years, and its long trains of carriages for passengers and goods may be seen in nearly every country in the world. There are railways thousands of miles long ; from the west coast of Portugal in Europe to Vladivostock on the sea of Japan ; across the United States and Canada and Australia from East to West ; and in Africa from the Cape of Good Hope to the Mediterranean seaboard of Egypt (except for a small section not yet built). India has in all about 35,000 miles of railway, more than any other country except the United States, Russia and Germany. In the United States the best mail trains frequently run at 80 miles an hour, in England 60 miles an hour or one mile a minute is the standard for important expresses ; but in India the mail trains average only half this speed. A race horse can run for a short distance at 36 miles an hour, a good riding horse or pony can generally do about 30 miles a day ; while draught horses pulling heavy loads can do perhaps 10 miles a day on the average. A cyclist can easily beat a horse in a day's run ; a motor cyclist can conveniently travel at 20 miles an hour, though his machine, if a good one, is capable of going at 50 ; while the motor car has a still better record. Thus in all cases the machine proves superior to animal power, both for speed and strength.

For work in tunnels and for climbing mountain ranges with heavy trains, the electric locomotive is

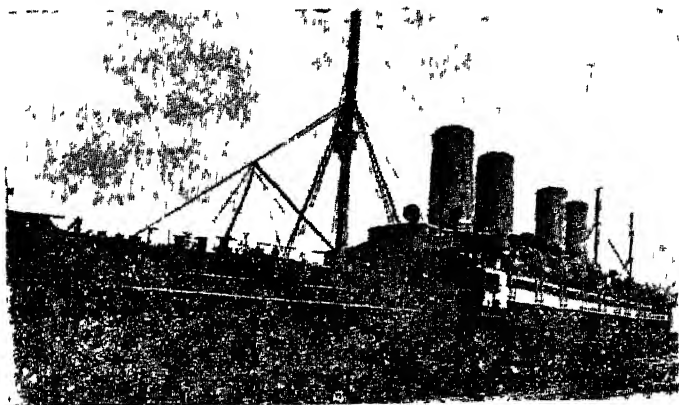


AN ELECTRIC LOCOMOTIVE

becoming the favourite. A new engine of this kind made for hill work in America has 7,000 horse power ; it uses up electric power when climbing the mountain, and stores up new power for future ascents as it descends on the other side by the force of gravity. Electric trains flash in and out of the stations on the underground railways in London and some other large cities ; you descend by lifts deep into the earth, and find yourself in an underground railway station lighted by electricity ; presently a brilliantly lighted train rushes in from the dark mouth of a tunnel, you get on board and are whirled away through a long dark burrow deep in the earth to your destination, perhaps many miles away.

Still more remarkable than the land locomotive is the modern steamship, which can travel day and night over the waves almost with the speed of the railway train. There are vessels which can travel as fast as an English express train ; but these are not the large passenger steamers, such as those which ply between

India and England, which usually steam at about the rate of the average Indian mail train. The size of some of these vessels is equal to that of a huge building many stories high and a furlong in length, such

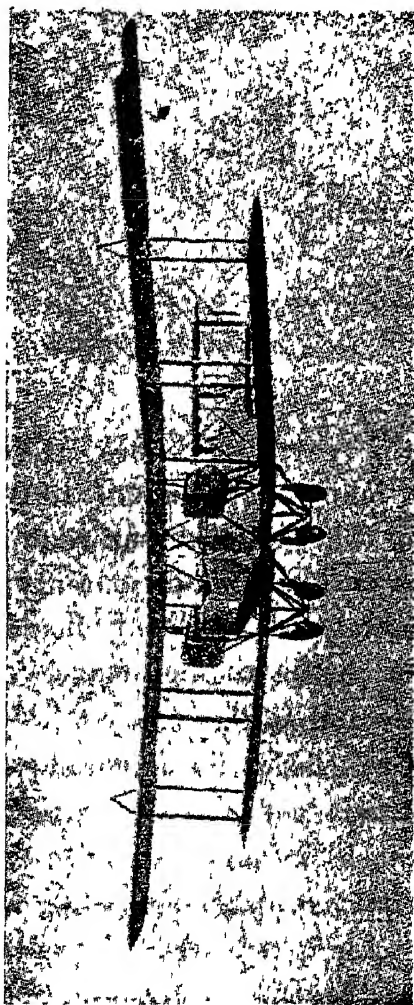


A LARGE STEAMER

monsters are capable of carrying more than a thousand passengers and many thousands of tons of cargo. Almost everything that civilised man requires in his home is to be found on board, and certainly he who invented for these ships the title of 'floating cities' did no more than justice to such marvellous products of human thought and skill.

The boat that can sail, or rather swim, under the sea is another modern marvel. It represents a distinct human achievement, though it is difficult at the present time to see of what use submarine craft will be to mankind, except for purposes of scientific investigation of the ocean depths, and the charting of shallow seas and harbour mouths for the convenience and safety of surface navigation.

But undoubtedly the most astonishing sight for our visitor would be that of man riding joyfully above the clouds, skimming along almost as gracefully as a bird in his winged aeroplane, or sailing steadily and swiftly onward in his dirigible or steerable balloon.

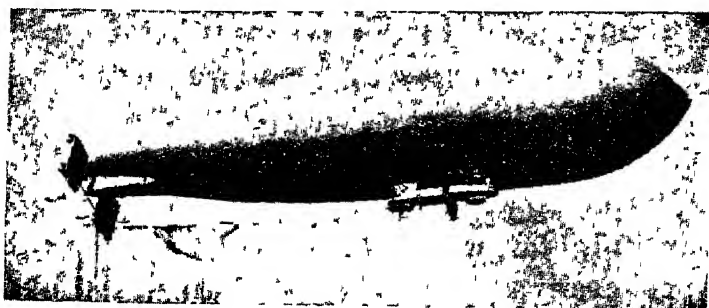


The first of these machines is noted for its swiftness; the second for its steadiness and carrying capacity. The aeroplane consists essentially of one, two or three pairs of wings (and is called a monoplane, a biplane or a triplane accordingly), moved against the air by a powerful motor engine. These are the swiftest of all things—light aeroplanes built for speed can travel at nearly 150 miles an hour, five times the rate of the average Indian

mail train, and they can rise to a height of over 17,000 feet, far above those huge piles of white cloud

that look like castles in the air, but not so high as those fine wisps of icy cloud that are sometimes, though not often, to be seen in the remote heights of the sky.

At the present moment Italy leads the way with successful dirigibles, a machine having been produced which can rise nearly 20,000 feet when not heavily weighted, or can carry about 20 people at a height of 13,000 feet with remarkable steadiness. With such a load it can remain 40 hours in the air, and can travel a steady course in variable weather to a



DIRIGIBLE BALLOON OR AIRSHIP

distance of 2,000 miles within this time. Machines similar to these will shortly be carrying 50, 100 and even 200 passengers, and will probably be a safer and more comfortable mode of transit than the railway train.

You the student, the new citizen of our new civilization, are really this visitor, may you share in the advantage and enjoyment of these modern human triumphs, and do your part in adding to them with your own right hand.

CHAPTER XVII

APPRECIATION OF BEAUTY

THERE is another important feature of human life that we have already briefly noticed—man can appreciate beauty, and by his works of art he can communicate his feelings and emotions about beauty. This sense of beauty is not established by reason, like knowledge of material facts. We should never think, “Gaurishankar is 29,000 feet high, therefore it is beautiful,” but we should stand and gaze up at that glorious peak and exclaim, “It is beautiful; it is magnificent” We cannot quite tell why, but we know that its beauty thus contemplated enters into our minds and hearts, purifying, calming and strengthening. Our sense of beauty is a faith, not a knowledge; and we have all found that to submit to that faith and encourage it leads us to what is true and beneficial. It belongs to the dim region of consciousness which is to be lighted up brilliantly in the future, when we have grown more spiritual. Just as reason is a dim light in the animal mind now, but becomes brighter and clearer as the animal approaches nearer to man, so is this reverence and love for

what is beautiful—a dim light of our spiritual life, and an inspiration for the development of all our best emotions.

When this reverence for beauty is well grown in a man's heart he begins to desire to communicate the joy of it to others; he wishes that others shall share his happiness in beauty. Then perhaps he begins to work as an artist. We have seen that even those who are working upon objects of utility, such as buildings and machinery, also bring in points of beauty, and arrange the proportions and outlines of their structures so as to please the emotions of the observer. This desire that all things about us should be beautiful was one of the glories of old Indian civilisation. The beautifully-formed wooden pillars of the verandahs and inner courts of the houses, the embellishment of doors and beams with beaded designs and central ornaments, the exquisite contour and finish of the water-pots, the excellent and chaste bordering and pattern-work of hand-made cloths, all enriched the home lives of the people. But it is a fault of our modern days of struggle and hurry that we are too often content with what will merely serve a useful purpose, and the craftsman and artist are not allowed the leisure required for perfect work and for contemplation of their art. Thus among educated people much of the beauty of Indian home life is passing away, and among the craftsmen that skill which has commanded the admiration of the world is

rapidly declining for want of patronage and nourishment. What will become of the beautiful shawls, muslins, embroidered silks, silver and gold work, wood carving and other crafts, unless it be to supply the needs of rich people in distant lands? The good citizen will see that in his own surroundings there shall be beauty, for the sweetening of his own character, and for the spiritual benefit and material refinement of all those who enter into his life

While beauty is apparent to all our senses—in delicate perfumes to the sense of smell; to the sense of taste in the wholesome flavour of sattwic foods and drinks, in the soft texture and surface of fine cloths to the sense of touch—it is through the eye and the ear that we receive our greatest enrichment, in the contemplation of beautiful forms and sounds. For the eye we have architecture, drawing, painting, dyeing, sculpture in statuary and relief, moulding and modelling; work in stone, wood, ivory and metal—all forms of striving towards the light, and for the sharing of light.

When we study the works of pictorial artists, we find that we can divide them into four main types, which merge gradually into each other. These are the literal, the emphatic, the impressionistic and the suggestive, of which the literal and the suggestive are extremes. Examples of the first are Ravi Varma's pictures of the boy Krishna, which have the effect of reminding the beholder of his own thoughts and

emotions, and of associating then more and more with the common things of life, while some splendid examples of the suggestive type are to be seen among the recent work of painters of the Bengal school—in this case the effect is not to remind the beholder of his own thoughts, but to communicate some of the deeper feelings of the artist, whose light in the region of beauty is less dim than that of common men.

The emphatic and the impressionist types lie between these two; the former educates the eye, while the latter aims at the imagination. For example, an emphatic painting of a sunset may at first strike us as unreal—we are tempted to say that such colours do not exist in the evening sky, but when we look again at a sunset we realise that the artist saw true, and that our own vision had been at fault. Many Rajput and Moghal pictures belong to this class, laying wonderful emphasis on detail; and modern pictures of rich ripe fruit and various other such studies also belong to it. The impressionist picture, like those of the famous Turner in England, aims generally at educating the imagination by inviting speculation and discovery, as one might ask a child to discern giants and castles in the ever-changing heaps of clouds.

The effect of modern statuary, following especially the Greek models, is often of the emphatic type. In the great riot of detail that is all around us in the streets we do not notice, for example, the beauty of

form and poise of the woman who passes us carrying a water-pot, but the sculptor setting forth her image isolates the beauty and thus educates us to see it everywhere. For this reason statues are not coloured, as that would distract the beholder from the strong impression of form and grace. Much sculpture is, however, symbolical, such as the image of the dancing Shiva, and it is intended to appeal more to the understanding and to the observer's thoughts and emotions than to the sense of beauty, for to grasp the idea intended by the artist one has to interpret the symbols like a code, or like the words and sentences of a language. Many curves, designs and outlines which are artistic and decorative are also isolated from nature, as they belong to living forms, and to objects such as leaves and shells, which are generally lost to the careless observer in a mass of detail, but when separated appeal to us at once on account of their inherent beauty.



Sculpture and Moulding

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An image of Shri Krishna

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CHAPTER XVIII

MUSIC AND POETRY

BEAUTY of sound in the form of music has been appreciated, like pictorial beauty, from the earliest beginnings of human civilisation, when our primitive ancestors lived in caves and carved pictures upon bone, and early shepherds and cowherds cut their ~~first~~ flutes with which to make melody of sound. The effect of music (which is a melodious and harmonious succession of sounds) upon our emotions has been recognised in every country, but of all nations the Greeks admitted it to the largest share in their lives. They were always glad to think of the divine incarnation, Orpheus (whom we may almost call the Krishna of Greece), as charming the world with the melodious beauty of his lute. Shakespeare or Fletcher (nobody knows which) has put this ideal of the Greeks in strong English verse

Orpheus with his lute made trees
And the mountain tops that freeze
Bow themselves when he did sing
To his music plants and flowers
Ever sprung, as sun and showers
There had made a lasting spring

Everything that heard him play,
Even the billows of the sea,
 Hung their heads and then lay by
In sweet music is such art,
Killing care and grief of heart
 Fall asleep, or hearing, die

This verse is in itself a little piece of impressionist music, it does not inform us, but it invites us to speculate and discover the not obvious truth about the full power of music. Surely where sounds are pleasing the sweet-natured devas will abide, and they will shrink as man does from the discordant and harsh, so where sweet music abounds, in the home or in the fields, plants, animals and men alike are uplifted and refreshed.

The sounds of nature are sweet—there is rarely harshness and discord—as in the music of a rippling stream, of the crash and roar of the ocean breakers, of water falling over rock, of the wind in trees, and of most healthy, happy living things. To natural sources of music man has added a great variety of instruments, from the mellow flute to the rich strong tone of the trumpet and the organ; from the lyre and harp and sitar to the violin and piano; but it is in the voice of a person of pure life swayed by high and great emotion and trained in purity of tone and self-control that the highest and most moving beauty of music is to be heard. In singing and poetry, free and unconventional, music reaches its highest power to move

and to uplift, to strengthen in courage and to melt



PLAYING THE WELSH HARP

to softness ~~in~~ pity or love, to refresh the weary and soothe the agitated

Poetry adds the power of music to enforce a spoken idea too spiritual to be grasped by any mere description in words. It is as though the poet were to say: "You must not only try to understand my words; you must submit yourself entirely to feel with me, for there is not merely truth in these ideas, but beauty also." In its highest form, poetry is thus suggestive, not merely impressionistic.

If asked what are the elements of beauty in a picture, we could distinguish four; form, colour, grace or poise, and proportion or balance of the parts. In music also we have these four, as, the melody which is the succession of simple sounds (the form), the tone and expression (the colour given to the form of sound by the nature and material of the instrument, and also by the touch of the player), the time-rhythm (or poise), and the harmony of simultaneous and successive parts. Of these four none is more essential to beauty than rhythm, which is the sãttwic element in music and other forms of art. An endless repetition of the same sound or curve would be tãmasic, inert; a constant change would be rãjasic, uncontrolled; but sattwa is rhythm, not stability nor motion, but stabilised motion, licensed motion, grace. With sattwa alone is there true beauty in art.

This then is to be realised that through all-per-vading beauty man's emotions are nourished and his progress is assured. Just as the fertility of the earth is the nourisher of his body, so in the world of beauty his emotions have their home and their nourishment which is inspiration. Because of the former truth, productive work is religion; because of the latter, art, the worship of beauty, is religion. Following these faiths at all times, man has never been misled. And the third religion is reverence for law, science, by which the intelligence is fostered throughout its age-long growth.

CHAPTER XIX

SPEECH AND WRITING

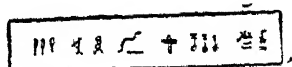
No power that man possesses has been more useful to him than that of speech, by means of which he can communicate his thoughts. As the wielder of this power he ranks far above any of the animals, which appear to be limited to the communication only of their feelings, such as disappointment, hunger and satisfaction, by means of expressive sounds and gestures. There can be no doubt, however, that the man-like apes have a language of definite words, expressive of desires as well as feelings. Dictionaries of these words are in course of compilation, and several scientists have given their time to the work, by studying those animals which are caged in the zoological gardens, or by caging themselves in the middle of African forests so that they may safely listen to the chatter of the monkeys and try to record it.

One of the great advantages of speech, vocal and written, is that knowledge gained by one can be passed on to others and permanently recorded and tabulated. It permits the progress of knowledge with the

aid of works of reference. Just as you would have great difficulty to work out a complicated sum if you could not write it down, but had to remember all the figures, so would a great chemist or engineer have difficulty in his work without books of reference. Speech gives mankind intellectual association for mutual benefit; even in leisure hours we may enjoy the company of the great and good by reading their thoughts, whereas without speech and writing such beneficial association would have been impossible, and man would have been obliged to amuse himself like an animal in his spare time. As Bhartrihari says in the *Nṛsataka* "The man who has no sense of literature and music is like an animal; though he has not horns and a tail, and does not eat grass, he lives a life exactly like that of cattle." Among the greatest benefits of speech is the power of co-operation, by which many may work together at a large undertaking, such as the building of a palace or of a railway engine. The advantages of this power are nowhere better illustrated than in an old Mesopotamian story which tells how men were resolved to build a tower that should reach to heaven, and that their work was progressing well until they were suddenly deprived of their common language, whereupon confusion arose, none understanding what others required, so that the tower could not be built.

We have seen that man can not only communicate his thoughts by speech, but can also communicate and

record them in written form, and it is in this power that he is unquestionably unique. The earliest writing seems to have been in picture form, as in the Egyptian hieroglyphics where, for example, several wavy lines signify waves, water and the sea, the written form thus being not a complete picture, but a part of the



HIEROGLYPHICS

object sufficiently characteristic to make the meaning easy to read. This method passed into the phonetic form, in which vocal sounds are imitated by signs, as would be the case if the picture of a serpent, which first represented a serpent, began to signify nothing more than the sound of its first consonant s. Thus alphabets arose, unfortunately not one for the whole world, but a great number in different countries, which has done much to produce confusion among the peoples, like the loss of common speech in the Mesopotamian story. So a written language is now a code, consisting of a number of signs, which can be understood only when the meaning which convention has attached to them is known. As well as alphabets we have two other codes which are widely known—the codes for signalling with flags, or flashes of light, or the clicks of a telegraphic machine, which all work for the eye or ear, and the code by which the blind may write and read, which consists of various arrangements of raised dots on stiff paper, which signify the letters of the alphabet and

can be readily interpreted by the touch of the fingers.

Indeed it is true that even spoken language is a code. There are few words that resemble what they represent, though we have some in English, such as "jingling" (of a horse's bells) and "hiss" (of a snake), though these can obviously only be names of sounds. Spoken language is thus a set of arbitrary symbols, which have to be interpreted by the hearer before he can understand their meaning. In this, speech differs from music and pictorial art, which give direct experience and instruction to the hearer and the observer.

For still further increasing his power of communication, man has invented many wonderful machines. In old times knowledge was sometimes spread abroad by means of monuments, such as the famous inscribed pillars erected in various parts of India by the great and good Buddhist king Asoka, in order to instruct the people in the way of virtue. To replace the old cumbrous stone and clay tablets, and the palm-leaf manuscript of comparatively later times, we have now books, which can be multiplied almost indefinitely by the printing machine, and have the merit of being easy for the eyes (when they are good), and cheap, so that all may enjoy them. Then we have marvellous reproductions of the living voice by those wonderful inventions the phonograph and the gramophone, in which a record is taken upon waxy material of the

impressions made by the sound of the voice, and when this record is put into the machine it brings forth the sounds. We have the telephone, by which men can speak to one another at a distance of miles—only recently a party of gentlemen in America listened at the same time to the roar of the breakers of the two great oceans, the Atlantic and the Pacific by means of telephone wires stretching across the continent of America, a distance of about 2,500 miles. We have the telegraph by which we can communicate with great speed across continents and oceans, and even round the earth; and we have the heliograph for sending flashes of light by day, and the searchlight for night. In addition we can represent our thoughts pictorially, and thus give most valuable instruction in useful arts as well as in social manners by means of the moving pictures of that most valuable educational machine, the cinematograph.

CHAPTER XX

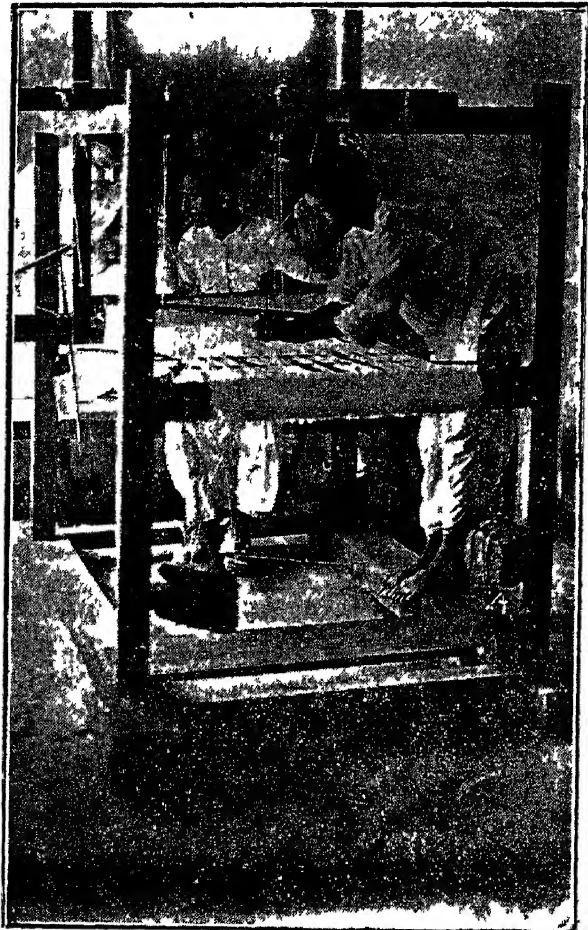
THE DIGNITY OF WORK

It is well known that the primitive man or the savage has no love of work, and that when he has satisfied his hunger and other simple needs he prefers to spend his time lying indolently in the shade of a tree rather than to seek by work to make any improvements in his surroundings or in himself. Very often the same defect is to be seen among civilized men. In this case, however, only the most degraded can become idlers, homeless and workless, wandering and begging not because they are strenuously seeking spiritual life or transmitting to others beneficial magnetism, knowledge or other help, but because they are too lazy to work or to arrange their lives properly and decently, and too tāmasic to desire improvement. But in many other cases it takes the form of an anxiety to get rich quickly, so that time may afterwards be spent in luxury and idleness.

Such a tāmasic man is ignorant of two important facts—first, that the happiness accompanying and resulting from successful work is far far greater and more permanent than the pleasures of idleness and luxury; and secondly, that work makes man more man and less animal. The animal can eat and sleep; it is reserved for man to do creative and artistic work. It has already been pointed out that man alone has been endowed with a developed hand, and man alone

can enjoy the pride and privilege of using it ; how foolish then is the person who clings to that false idea that to work with the hand is degrading ? In that case to be man would be degrading, and to live as a tree or a vegetable that merely sucks in food from the adjacent air and soil would be a lofty and inspiring state

Manual work is not degrading, whatever foolish people may think or say, it is elevating, for it brightens the mind by bringing to it direct experience as distinguished from knowledge conveyed by words (a very indirect and imperfect



BOYS LEARNING WEAVING

form of experience) and it educates the will to definite achievement. It you have ever done a good, honest, sound and complete piece of useful work with your hands, even if it is only the very humble one of dusting your room and making it thoroughly clean and tidy, or that of putting your bicycle into good condition, you will know the truth of this. It gives you a sense of being able to accomplish things, which always is a sign of developing will-power. An American poet, Longfellow, has sung of the satisfaction of steady useful work in his *Village Blacksmith* :

Week in, week out, from morn till night,
You can hear his bellows blow :
You can hear him swing his heavy sledge,
With measured beat and slow, . .
Toiling—rejoicing,—sorrowing,
Onward though life he goes ,
Each morning sees some task begin,
Each evening sees it close .
Something attempted, something done,
Has earned a night's repose.

The work of the village blacksmith has in it something of each of the six divisions or kinds of labour .

Skilled or unskilled,
Creative or mechanical,
Mental or physical.

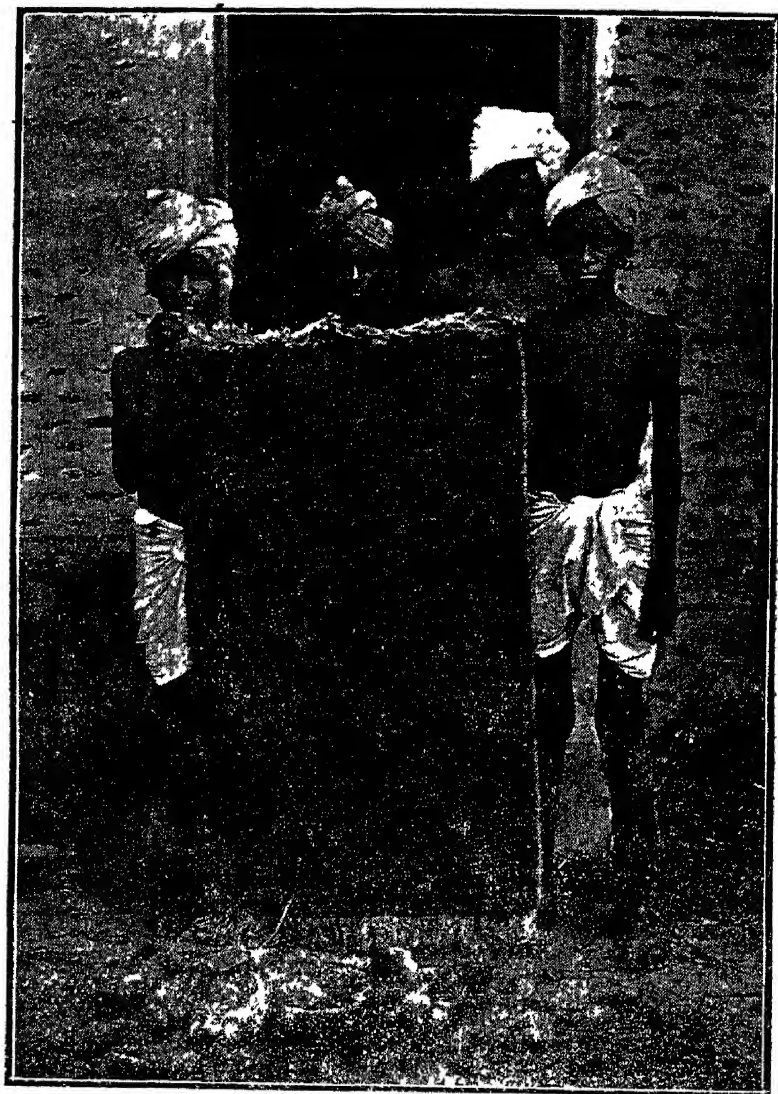
Whenever work is done with an object of utility or beauty, or of both, these classes appear. To drive a motor-car through traffic, to lay bricks evenly and build a wall straight and strong, to put together or

‘compose’ printing type, to ‘assemble’ the parts of a bicycle or a clock, are all examples of skilled labour. To drag a hand-cart, to carry bricks up a ladder, to turn the wheel of a hand printing-machine, are all forms of unskilled labour. To sew together hour after hour marked pieces of cloth is mechanical work, but to cut out the cloth to form a garment beautiful and well-fitting is creative work. Work such as writing a book, designing a new garment, discovering the defect in a broken clock, supervising an estate, is largely mental, whereas work requiring but little mental attention is classed as physical.

The benefit of work is lost if it is carried on beyond the point of fatigue, under conditions bad for health, or so long that it becomes monotonous, as is too often the case in factories and mills. Labour which is almost purely mechanical should not be done by man, except off and on in conjunction with other work, when it is valuable as diluting the strain of mental, creative and highly skilled work. Man’s work is not that of a beast of burden or of a machine, but is properly characterised by some degree of skill, creative power and mentality.

To seek enjoyment in idleness and sensuous pleasures (tāmasic and rājasic aims) is to find depression, and perhaps even ill-health, for these pleasures do not belong to the human soul. On the other hand, work is the great cure for sorrow and depression of spirits, especially when it is work undertaken to make

other people happy, directly or indirectly, and pursued without haste or hurry—such is the power of



PANCHAMA BOYS AND THEIR WORK

sāttwic work. In the stately, dignified life of old days, the nobleman took a pride in the good

cultivation of his lands, the good condition of his tenantry, good service to his family and country, and the encouragement of craftsmen who could make useful and beautiful things, for he recognised that worthiness and true wealth lay in these works, not in any display of richness, extravagance and wilfulness. Such a man must inevitably acquire the dignity which comes from a consciousness of worth, and must gain a sense of strength and power steadily developed and held in reserve for days of trial that may come

From this let us realise the fact that if riches make us sluggish they are a source of injury, not of benefit ; far better indeed that they should be torn from us, and that we should be forced to develop our powers by work under the necessities of comparative poverty.

CHAPTER XXI

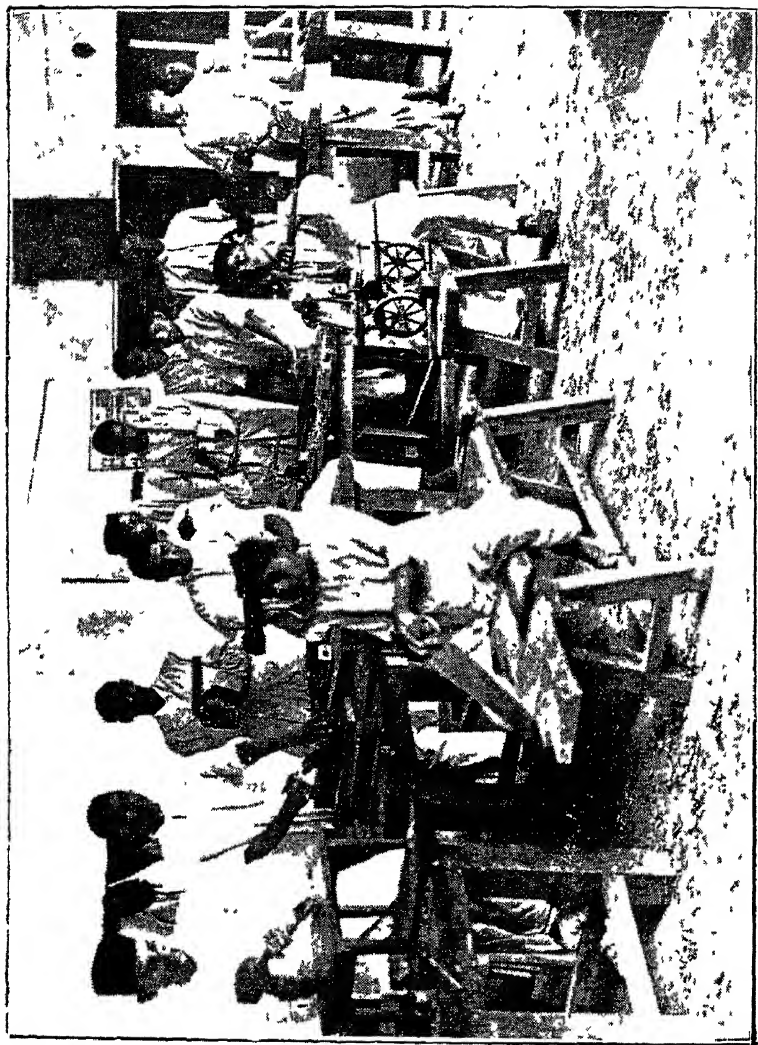
DO IT WELL.

WE have already distinguished between man and the animal and other sub-human kingdoms of nature, and have learned what it is to be a man and to live a human life, exercising human powers. There is finally another point of distinction which is of the utmost importance—that the appetites are different. The animal desires to satisfy its hunger and other physical cravings, but man desires improvement. There is in him what is often called ‘divine discontent’ which will not let him be satisfied with what has already been attained, but is constantly urging him on to seek further improvement; and though the tāmasic man may have very little of this higher desire, there must be some little of it at least or he would not be worthy of the name man.

Success in life is to be measured by this improvement. No matter where we stand, high or low, with much or little power and ability, our life is a success if we have used our powers well and improved them by use; it is a failure if we have not. If you develop your will-power and become more capable of doing



An Indian Carpenter and his work
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Boys Learning Carpentry

[To face page 115₃

things, if you develop your mind so as to increase its power of understanding, if you develop your social feelings, such as love, kindness, good comradeship and sympathy—you are making a success of your life. It is only such success that can give real happiness, because it makes man more godlike, and carries him on towards his goal of perfection. The value of the unresting desire that urges him ever onward is pleasantly expressed in George Herbert's poem.

When God at first made Man,
Having a glass of blessings standing by,
Let us (said He) pour on him all we can,
Let the world's riches, which dispersèd lie,
Contract into a span.

So strength first made a way,
Then beauty flow'd, then wisdom, honour. pleasure.
When almost all was out, God made a stay,
Perceiving that, alone of all His treasure,
Rest in the bottom lay

For if I should (said He)
Bestow this jewel also on My creature,
He would adore My gifts instead of Me,
And rest in Nature, not the God of Nature -
So both should losers be

Yet let him keep the rest,
But keep them with repining restlessness;
Let him be rich and weary, that at least,
If goodness lead him not, yet weariness
May toss him to My breast.

All of us who are loyal to humanity, as soon as we realise what it is to be a man, desire to be as good a

man as possible—capable, intelligent and good-natured. Not only in loyalty to humanity and ourselves,



SCHOOLGIRLS ACTING SAVITRI

but also in loyalty to the country in which we live, must we maintain the same desire; for a country prospers when its citizens are making the most of their individual lives. Every unskilled worker who fits himself to become a skilled one, every one who becomes a creative or mental worker, is not only raising himself but the whole nation in which he lives.

When you have realised that this improvement is the most important thing in life, there are two vital truths to be understood (1) that it cannot be gained without effort, and (2) that it can be gained amid all the small experiences of daily life. You must pay

for what you want ; if it is to develop the muscles of your arm, you must pay the price, which is effort given to arm exercises, and time and thought expended upon them , so also if it is to develop capability,



SAVITRI

intelligence and good-nature, you must spend upon them the requisite amount of thought, time and effort

If it appears that some people are more highly endowed than others with these human riches, do not doubt the law of effort, but remember that they have worked unnoticed, either in the 'present life or in a previous existence—

The heights by great men reached and kept
Were not attained by sudden flight
But they, while their companions slept,
Were toiling upwards in the night.

The secret of success in this self-training is summed up in the phrase "do it well". Whatever you have to do, do it well—let quality rather than quantity of work be your aim, and put your thought, feeling and energy into it. Suppose it is so small a



SAVITRI

matter as that of writing a casual letter; let it be as short as is consistent with clear conveyance of your thought, carefully worded, and neatly written, so that it may be read without loss of time, temper and eyesight. Then, you have not only written a letter—you have trained your brain to think clearly, your hand and eye to work accurately, your nerve to act steadily, your artistic sense to open freely, and you have gained self-control, which is will-power. This

rule "do it well" applies to everything you have to do, however small a matter it may be. Looked at in this way, the whole of your daily life is crowded full of opportunities for real success. To aid yourself in this noble effort, you can always have satsanga, association with the great and good, for when you have not actually their presence you can have the company of their thought and wisdom in your favourite books.

Those men are good men who study the good of others without regarding themselves. Those men are ordinary men who, while they benefit others, do not neglect their own interests. Those men are demons who destroy another's good for their own profit. What shall we call those who aimlessly destroy that which is another's?

BHARTRIHARI

CHAPTER XXII

THE EXPANSE OF HUMAN AFFECTIONS

AMONG the things that man can do, there is scarcely any equal to his power of deep, strong love, not only for his immediate family but for his nation and for humanity throughout the world. In obedience to this love he is often prepared to sacrifice all his possessions and even life itself. In the ancient literature of India no man is more highly honoured than he who is thus prepared to surrender his own pleasures and possessions when it is necessary for the benefit of mankind. In the Hitopadesa and a number of other Sanskrit works there appears a verse which says that personal advantage should be sacrificed when necessary for the welfare of one's family, family advantage for the sake of the village, village advantage for the benefit of the countryside, the advantage of the countryside for the sake of the nation and that of the nation for the sake of humanity. In other words, it is the unworthy man who loves only himself ; the good man loves his family, but better is he who loves his village, and better and better still are they who can love also the countryside, the nation and the whole

of humanity. Such is the extension of the love and affection which first rise in family life, and then expand themselves to village, district, province, country and the whole world. The river of love rises in the family, and flows on, becoming broader and broader until it enters the ocean of mankind.

It must not be thought, however, that a man who loves and serves his country must therefore love his family less. That would be a great mistake. Such a man should have greater power of love than that of one whose affection is not strong enough to extend beyond his family bounds; hence his love of family is also greater. Thus an old poet sang about a man who loved his country so that he must go forth to fight for her, and leave for the time his remonstrant wife.

Yet this inconstancy is such
As you too shall adore.
I could not love thee, dear, so much,
Loved I not honour more

Family life is the great nursery of human affections, where father and mother, brothers and sisters, youngers and elders, and even grandfather and grandmother and brothers, wives and children, live in closest intimacy and mutual understanding, affection and help. The honour of the family is a thing that each learns to hold sacred on account of affection, so that if one brother has done wrong, the others will shield him from the criticism of the world and try with all affection

to help him to overcome his fault. Are we not always sorry when we hear anyone speak ill of his own family, or even of his village ? Does it not seem an act disloyal to family and contrary to the spirit of brotherhood, like that of birds who peck at one of their number which has been wounded, or like that of the insects which sting some of their companions to death or turn them out of the home when they have done their share of the communal work ? Further, in the family the stronger helps the weaker, and he who has knowledge uses it for the benefit of those who have less, not for his own advantage. The master of the house is the *bhartā*, the husband, the upholder, the mother the *bhāryā*, the one to be upheld, the elder brothers and sisters do not override the weaker and more ignorant, do not snatch from them their things, but rather yield up what they themselves have when the younger has need—such are the bonds of family affection in the home

The affections generated in the home expand to include the village, so that in the heart of a good man love of village arises, and there is a desire to make the village prosperous and happy, to protect the weak within it, to provide for the unfortunate, to see that the ignorant are taught, and that good water and clean and healthy conditions are obtained for all. So there is also a town feeling, such as that of the man of Madras, Bombay, Manchester or London. He does not suppose that his own town is perfect, but he

knows it as the source of many good things, without which his country and humanity would be the poorer. The learning of Oxford, the commerce of Manchester, the engineering of Glasgow, the shipping of Liverpool all contribute to Britain's greatness, and it is no wonder that the men of these towns love the places in which they have been nurtured, and to which they are bound by ties of gratitude and affection.

From the village and the town love expands to include the province. The Tamil people love their great civilisation, full of rich treasures of human culture garnered during many ages, the Bengali also knows the value of his own. The Irishman, Scotchman, Welshman, Englishman—each cherishes his own provincial qualities as a component of vital importance in the life of the British nation; which was compacted of these diverse elements only within the last few hundred years, yet has produced a character and type which is honoured throughout the world. The Indian union is older, for the various provincial types were united in the great Sānskritic national culture thousands of years ago, and indeed every cultured Indian must feel something at least of that ancient brotherhood of all Indians, which is called love of the Motherland or, in general, patriotism. We see the web of love growing wider yet in the British Empire, where bonds of mutual affection and esteem are being firmly woven, and in the idea of

the League of Nations which was intended to acknowledge human brotherhood throughout the world. The Aryan peoples, American, Teutonic, Celtic, Arab, Persian, Indian and others, are also more and more realising the fact that they were all born from one single family in the distant past, though they have migrated and multiplied in many lands. Above all comes that sense of brotherhood for the whole of humanity which makes us feel that every human being is in some degree a brother in a great world family in which the weak shall be protected, the ignorant taught, the oppressed relieved, the enslaved set at liberty, and brotherly love shall rule the earth.

Land of our birth we pledge to thee
Our love and toil in years to be,
When we are grown and take our place
As men and women with our race.

Father in Heaven, who lovest all,
Oh help the children when they call,
That they may build from age to age,
An undefiled heritage.

Teach us to bear the yoke in youth,
With steadfastness and careful truth,
That in our time Thy grace may give,
The truth whereby the nations live

Teach us to rule ourselves alway,
Controlled and cleanly, night and day,
That we may bring, if need arise,
No maimed or worthless sacrifice

Teach us to look in all our ends
On Thee for judge, and not our friends,
That we, with Thee, may walk uncowed
By fear or favour of the crowd

Teach us the strength that cannot seek,
By deed or thought, to hurt the weak,
That under Thee, we may possess
Man's strength to comfort man's distress.

Teach us delight in simple things,
And mirth that has no bitter springs,
Forgiveness free of evil done
And love to all men 'neath the sun

Land of our birth, our faith, our pride,
For whose dear sake our fathers died,
Oh Motherland, we pledge to thee
Head, heart and hand through years to be.

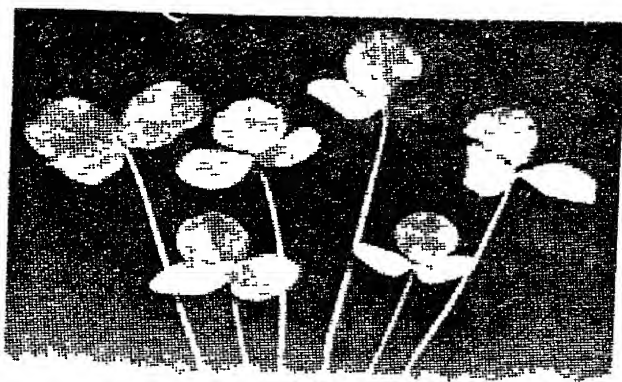
RUDYARD KIPLING



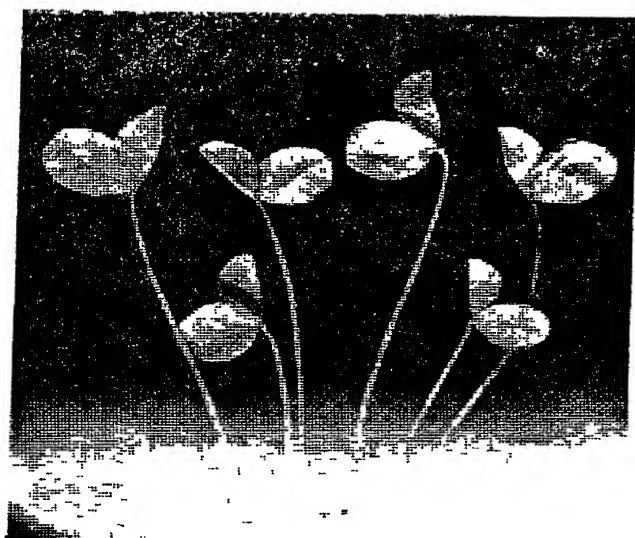
DAISIES BY DAY



DAISIES BY NIGHT



CLOVER BY DAY



CLOVER BY NIGHT





ART (From a painting by P. Thumann)

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STAGE II

WHAT WE OWE TO THE PAST

PART I

FOR THE OUTER MAN

1. The Earth Prepared.
 2. The Discovery of Metals.
 - 3 Human Dwellings.
 4. Textiles and Dress.
 5. The Discovery and Uses of Fire
 6. The Story of Lighting
 7. The Wheel.
 8. Land Transport
 9. Water Transport.
 10. The Story of Flying.
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CHAPTER I

THE EARTH PREPARED

It would be a very difficult thing for one of us, born and nurtured in the midst of an advanced civilisation, where the earth has been prepared for our habitation and use, to realise the difficulties of a life bereft of all the conveniences that we enjoy. To be deprived of fire and light, to have no tools but sharp stones, to have no machines, not even to know of the possibility of a wheel, to be without science, philosophy, art and religion, to be thrown companionless and ignorant, a poor shivering stranger, on a land where man had never lived, would be a picture of helplessness and desolation which we cannot imagine.

Let us take a less difficult object for our imaginings, and suppose that, clad as we are, with tools at our hands, with food and water ready within our reach, we set out for a long journey (let us call it a pilgrimage) through a country in which the hand of man has not been at work—such a country as India might have been long before our Aryan ancestors came from Central Asia, long before those aboriginals who preceded them had learned to prepare the

earth in any way for the special convenience of man. You would have to guide your steps by the path of the sun by day and the moon and the stars by night, for there would be no sign-posts and indeed no roads, there would be no maps, and no account of the positions of forests, rivers, marshes, lakes, deserts and mountains; and you, the traveller, would come upon these one by one and suffer endless delays and difficulties in climbing over obstacles, searching out the way, retracing your steps in the neighbourhood of mountains and marshes, working round lakes, crossing deserts, cutting your path through the thick undergrowth of forests and swimming rivers. Even where such huge obstacles did not appear in your way there would be no roads and generally not even tracks of animals going in your direction, but your journey would be over rough ground, often strewn with irregular stones and boulders or else overgrown with thick clumps of grass or small jungle growth, which would hamper your feet, cause you to stumble constantly, and force you to pick out with care almost every step of the way.

How long it would take you under such circumstances to journey from the place where Bombay now stands, let us say to Benares; with all the obstacles that we have mentioned to overcome! Now you can walk at four miles an hour over a good road but it is doubtful whether you could advance four miles a day over primitive country, and your journey of a thousand miles (in a straight line, as the aeroplane

flies) would cost you about a year of your life—a year of heavy labour rewarded with little progress, as we count progress who have had the earth prepared for us for thousands of years by the thought and work of thousands of ancestors, who have mapped out mountains, rivers, forests, marshes, lakes and deserts, and have built roads and trodden out paths.

From Benares to Bombay in our present day you would find good roads and paths well marked out all the way, and indeed almost everywhere over the 17,00,000 square miles of earth that constitute this huge land of India. How seldom we realise the value of these treasures bequeathed to us by numberless generations of men—even the road and humble path. If you have to walk two miles to school you might even think the road to be an irksome thing, stretching its long length between you and your destination, and you might wish that it were shorter. But it is better that it should go all the way, a level track for your feet—far better than boulders or ploughed land or rough ground broken with little nullahs and small jungle growth. From the standpoint of time and work, the road brings your destination nearer.

Our ancestors, however, have not rested content with laying roads over the solid earth—they have carried them through mountain ranges in the form of passes, and over gorges and rivers in the form of bridges; and the exploration required for planning out the

first, and the achievements of knowledge and skill in building the second, present us with a record of human courage, perseverance and skill that cannot but thrill us with admiration for mankind.

The bridges of our modern days carry not only foot and cart loads over small water channels and streams, but they span rivers miles in width and bear the load of railway trains rattling over them. At first bridges were made of wood, then of stone, and later still of iron. If you look under the small bridges or culverts which support the main roads near your village, you will see that the smaller ones are generally roofed with flat stones, while those that are larger are maintained by round arches. These round arches were a great discovery (made by the Roman people and bequeathed to all mankind) for their strength is enormously great. The railway bridges of India crossing the larger rivers are built of strong iron girders supported on stone piers rising from the river bed. The longest of these is that over the Sone in Behar, which is about two miles long, while the next, which has a length of a mile and a half is over the river Krishna at Bezwada. The longest bridge in the world is the Lion Bridge near Sangung in China, which has three hundred enormous stone pillars and extends five and a quarter miles.

Most marvellous are the huge modern iron bridges—some of them suspended by enormous chains, others projecting from each bank or stone pier until they

meet, others again balanced on a central pivot so that they can turn round like compass needles, and still others in the form of long iron tubes—which are called respectively suspension, cantilever, swing and tubular bridges. The greatest of these is in the heart of Africa, crossing the Zambesi river on the railway track from the Cape of Good Hope to Egypt. Other famous bridges are the Forth Bridge in Scotland, which has two cantilever spans each nearly a third of a mile long, the suspension bridge crossing the Niagara Falls in North America, the Quebec Bridge, and a tubular bridge a mile and a third long over the Saint Lawrence river at Montreal, both in Canada.

Think of the wonderful prevision and courage of Sir Benjamin Baker who designed the Forth Bridge, and of Sir William Arrol whose firm built it as well as the huge Tower suspension bridge in London—yet the latter was originally a workman in a cotton-mill and then a working blacksmith. Think of the bravery of the workmen putting together the Forth Bridge with the vast stretch of water 150 feet beneath them, and the enormous amount of work in the structure, which contains over fifty thousand tons of steel. Think of the courage of Gustav Lindenthal, faced with the task of swinging a single three thousand foot span, built to carry fourteen railway tracks side by side, across the Hudson river in the United States. All such courage goes to the enrichment of the future

generations of mankind, and its value cannot be measured in untold gold

Our ancestors have not only thus prepared the earth for travel and transport, but have also fitted it for agriculture and human habitation. They have removed huge primitive forests and drained marshes, and have cleared enormous tracts of ground of surface stones that would impede cultivation of crops. Marshy ground, unhealthy because damp and sodden, has in many cases been dried, and dry grounds in regions of insufficient and irregular rainfall have been fed with water by canals and smaller channels, and even by the deviation of the courses of rivers. Some of the works of this kind have been enormous, for example, the Marikanave dam built across a gorge in Mysore can store forty thousand million cubic feet of water, and thus provide for a large region which was formerly to a great extent infertile.

Irrigation works in India have existed from the most ancient times, and many of the modern ones are based upon ancient works. One of the largest systems is that of the Ganges Canal, which draws its water from the inexhaustible snows of the Himalayas, has over 500 miles of main canals and over 3,000 miles of smaller distributaries, and feeds water to nearly a million acres of land. In the Panjab there are over 11,000 miles of canals and distributaries; and the great Chenab Canal, which has brought a large tract of waste land into habitation in the

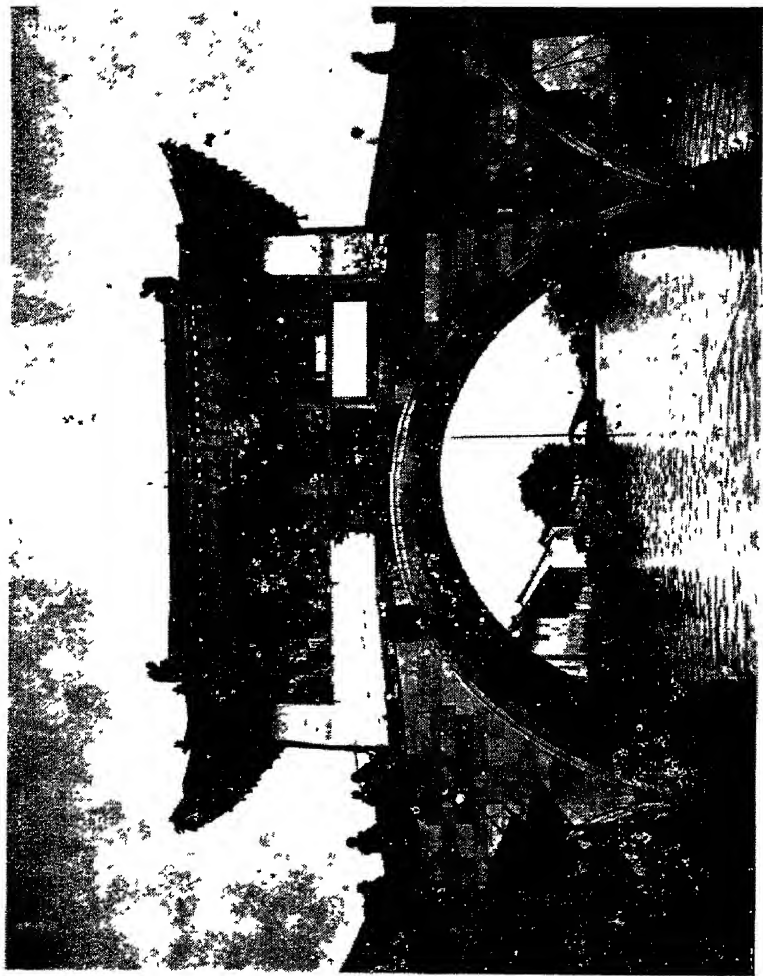
district of Lyallpur, irrigates about two million acres, supports a million people, and produces annually crops worth over four thousand lakhs of rupees. In the South of India there are the Kaveri and other schemes, while the whole country is dotted over with artificial lakes, tanks and wells.

In Holland the people have reclaimed 1,500 square miles of land from the sea, and they are now working at a scheme for reclaiming half a million acres of the Zuyder Zee which was over-run by the sea nearly a thousand years ago, for which they are building a dyke or wall 30 miles long, over 100 feet thick and nearly 20 feet high. Among the most wonderful achievements of the world is the great Nile irrigation scheme of Egypt. Egypt is practically a strip of land along the Nile ; it has no gold, coal or iron, but has something far more valuable, for the River Nile brings down each year millions of tons of rich muddy water, the greater part of which, however, is lost in the sea. High up the river the British have completed a huge breakwater, the largest in the world, at which worked the descendants of those who built the pyramids and the great temples of Egypt thousands of years ago, and this has formed a great lake from which the river supplying the whole country can be fed throughout the year when water is low

By cultivating the land with natural and artificial water supplies, enriching the crops, and working into

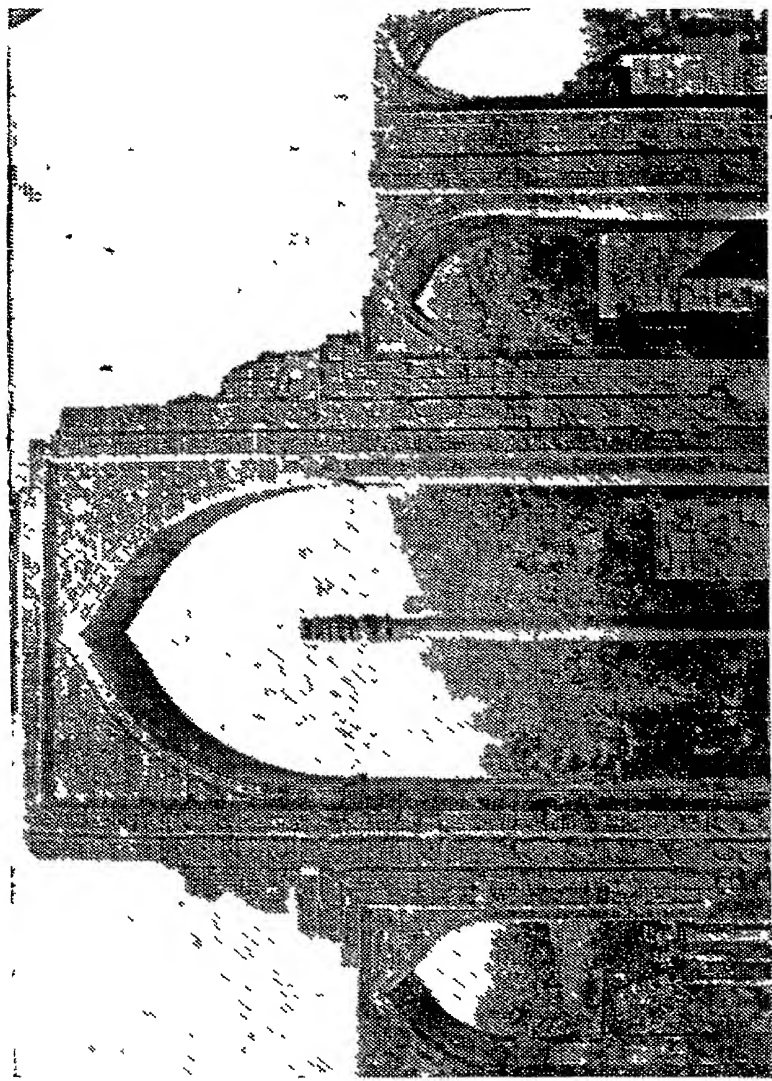
the soil a large amount of decaying waste vegetation as manure, our ancestors have increased the productivity of the land. All plant life depends upon nitrogen, which is drawn from the air by small creatures called bacteria which attach themselves to the roots and provide the plant with nitrogen compounds, much of which remains in the waste material of the plant that is used for manure to enrich the soil for further cultivation. Our ancestors have also explored the surface of the earth and dug down into it, and have found many places where we can obtain precious stones, metals such as gold, silver and iron, coal and mineral oils, such as kerosin and petrol. As a result of their labours we live in comfort and often in luxury upon an earth not rough and strange, but prepared for us by those who have gone before.





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An Old Chinese Bridge



The Iron Pillar, near Kutab Minar, Delhi [To face page 139]

CHAPTER II

THE DISCOVERY OF METALS

AMONG the richest of our inheritances from the remote past is that of the discovery and use of metals. The Vedic literature of India informs us that the ancient Hindus had already made great progress in the working of metals, gold, silver, copper and iron; yet we know that in the far more distant past, no one knows how many thousands or even lakhs of years ago, there was a time when man had not yet discovered metals, and possessed only stone tools and weapons. We know this because we have found the remains of man's early life, including these stone tools, in river-beds, caverns and other places, often covered deeply with earth which must have taken countless centuries to be deposited, and accompanied also by the bones of animals which have long ceased to exist. It is obvious that there could be no written history of such early times, for these men whose remains have been thus found could not write, though they had begun to draw; yet a study of these marvellously ancient remains has shown us that somewhere in the remote past some one of more intelligence than the rest made the discovery

of metals, imparted it to others, and thus set going that knowledge of metals and skill in their use which has made possible most of our modern triumphs, our modern buildings, our ocean-going ships, our railways and aeroplanes, telegraphs and telephones, and thousands of other things large and small, from huge steel bridges to tiny pins and needles, that contribute essentially to our modern civilisation, which is veritably the Age of Iron. It is not in art, philosophy and religion that modern civilisation is triumphant—it is in iron.

Thus among the lowest types of men stone tools appear, first in a rough and later in a polished form, in what is sometimes called the Stone Age. Most of these were weapons, for these elementary men were not versed in agriculture, and they depended largely on hunting and fishing, though the first men were frugivorous—eaters of fruits and roots. Then followed the Age of Bronze, when gold was discovered (probably on account of its bright colour) and copper was used for many kinds of tools, and then copper and tin were melted together and poured into moulds to form bronze implements. This was followed by the Age of Iron, when men have acquired the skill to separate this hard metal from the earth or ore with which it is found, and learned to use it for the hard parts of weapons such as swords, axes and spear-heads, while bronze continued in use for the handles and for ornaments.

How poor we should be without tools of iron and steel can easily be realised by the boy scout who has been out touring or camping, and has learned to know the value of the axe and knife that he always carries, or by the reader of the famous story of Robinson Crusoe, who was shipwrecked alone on an uninhabited island, but was able to dig out for himself a good cave dwelling, to protect it with a strong wooden palisade, and to provide himself with all that was necessary for his comfort by means of the axes, knives and other tools that he saved from the ship.

We come down to historic times. The epics of India, the Rāmāyana and the Mahābhārata, show that men in those days had acquired great knowledge of the uses of gold, silver, copper, tin, lead and iron; and throughout succeeding ages the artizans of India have shown remarkable skill in all kinds of metal work, both beautiful and useful, on a large as well as on a small scale. For example, near the Kutab Minar outside Delhi there has stood for the last 1,500 years a large iron commemorative pillar which is still free from rust, and has a perfectly clear inscription. This pillar proves that the Hindus in those times were capable of forging a bar of iron larger than any produced in Europe until quite lately, and rarely equalled even at the present time. For steel work there is nothing in the world to excel the famous sword blades of Damascus, which were made of Indian steel.

The invention of steel (which is iron to which a certain quantity of carbon and other substances has been added) was a great advance on the discovery of iron, for it is harder and more flexible, can take a keener edge, and can be tempered to different degrees of hardness by different modes of heating and cooling, yet the invention took place in such remote times that we have no record of it.

We owe much to the past on account of the discovery of other metals besides iron and steel, and each of these metals has its own special qualities and utility. Thus for example, we cannot use iron to cover our roofs, for it would rust away, but we can use sheets of zinc, or sheets of iron covered with a thin layer of tin, which are then called galvanised iron. Silver threads can be used without danger for sewing up the inner and outer parts of the body after a surgical operation. Gold will never rust, and it is so malleable and ductile that it can be beaten into leaves of which a heap of three lakhs placed one on top of another amount to only one inch in height, and it can be drawn into wire so fine that two hundred yards will weigh only one gram. These examples give but the slightest indication of the variety of metals brought into use by human industry in the past and constantly being enriched by the wonderfully painstaking labours of the scientific men of the present day.

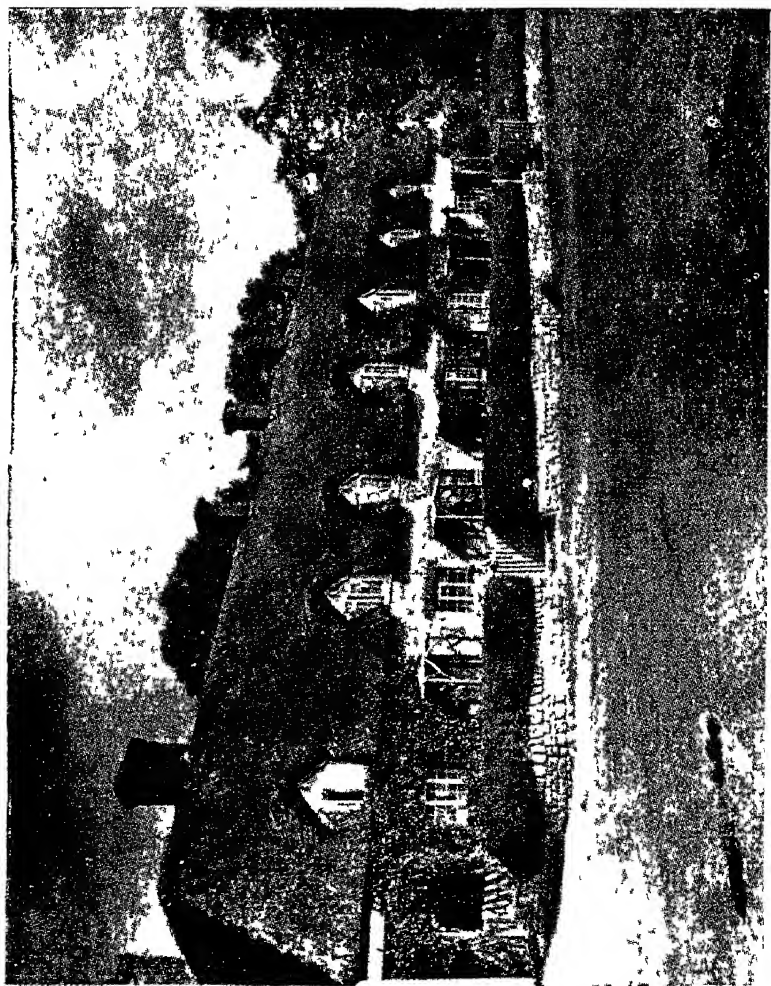
Two other ancient inventions on account of which we owe an immense debt to the past are glass

and pottery. Every one remembers the story of the palace of glass which the Pāndavas built, in which Duryodhana made himself ridiculous by holding up his cloth when passing over a glass floor, thinking it to be water, and by walking into glass walls which he thought to be open doorways. Glass was also known to the ancient Egyptians and the trading nations of the Mediterranean, and passed on by them to the Greeks and the early inhabitants of Italy, and thus spread throughout Europe. Pottery appeared even in prehistoric times, when no doubt men found that the clay that they daubed on their primitive cooking vessels (of skin or leaf or whatever they may have been) to prevent them from being burned became hardened by the fire, and that rough clay pots could thus be made. The glazing of pottery improved the art, and it was thus known to the ancient Egyptians and Babylonians. The Arabs carried this knowledge to Spain, whence it passed to Italy, Holland, and other European countries. Pottery has lent itself especially to the production of most beautiful and graceful forms, for which India, Japan and China have long been famous. It was but a short step from the invention of pottery to that of bricks and tiles which are also of unknown antiquity, and were made and used by all the great ancient nations

CHAPTER III

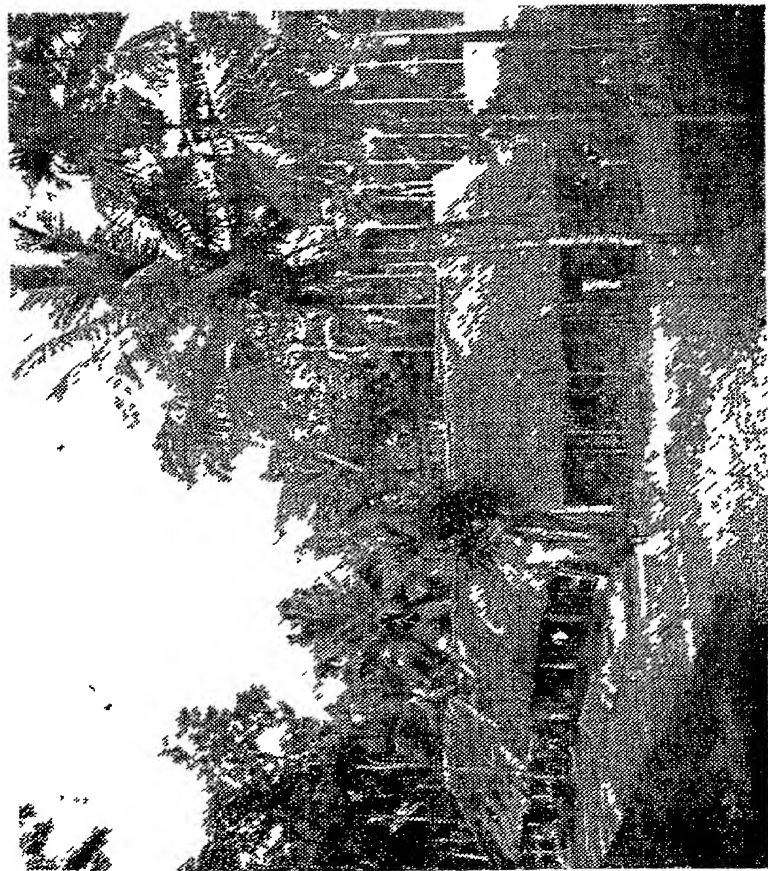
HUMAN DWELLINGS

IF we were to enquire into the causes why primitive man sought a dwelling of a particular kind, we should find that they depended much upon the climate and other conditions in which he lived. Everywhere he would want shelter from storms of rain and wind and from the excessive heat of summer and the cold of winter, protection from dangerous wild animals in the night, a safe storage place for his food, tools and other possessions and, most important of all, a home for his young for, as a great philosopher has said, "The care which covers the seed of the tree under tough husks and stony cases, provides for the human plants the mother's breast and the father's house". Thus primitive man betook himself to caves, to holes dug in the ground and roofed with the boughs of trees, to huts built of canes and reeds and daubed with mud, to mud-walled huts with roofs thatched with broken branches or bamboos and grasses, reeds, straw or leaves, to tents made of the skins of animals, and to huts made of rough logs of wood or piled-up stones. Most strange of all were the houses



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ENGLISH COTTAGES



AN INDIAN VILLAGE

[To face page 145]

of the ancient lake dwellers, who sought safety by building their huts on platforms fixed on piles in a lake or watery marsh, only equalled by the huts of snow built by the Eskimo for warmth and safety amid the ice and snow of his northern land, and by the caravans used by the Huns (who travelled from Asia to fight the Romans and the Goths) and some of the wandering Gypsies of Europe at the present time.



ANCIENT LAKE HUTS

As man progressed he discovered one by one materials of greater strength—the use of clay for making bricks and tiles, dried by the sun and baked by fire; the use of stone, burned out of surface quarries and dressed with hammer and with chisel, in blocks for walls and in slabs for floors and roofs, the use of slate split and cut into sheets, and zinc and iron rolled into sheets for roofs. He discovered the use of nails and later of screws, for fastening wood, slate and iron, so that he need no longer tie together his

roof branches to support the thatch, but might saw and plane and nail or joint together his neatly squared rafters. He discovered the use of burnt limestone mixed with sand and water to form a binding mortar, and later the still stronger cement which is made of lime and clay burnt and ground together into a grey powder. He discovered the use of steel for joists, girders, trusses, and even for the walls of lofty buildings in this later age of iron.

As man progressed he thought not only of safety and strength in his dwellings, but also of beauty, comfort and health. He made the important discovery that while he sought within his house refuge from the dangers without, there was still greater danger indoors from bad air and unclean conditions. His diseases began to multiply, especially where many people were living in one house or in houses crowded together. He learned that the air that he breathes out is different from that which he breathes in, that its life-supporting quality has gone out of it; and he thus found that windows were not only required to admit cooling breezes during hot days, and to provide the interior with light, but that they were necessary even in cold nights, for people sleeping in closed rooms, where the life-giving air was soon spent, began to lose their vigour, to derive but little refreshment from their sleep, to become subject to headaches, lassitude, weakness and disease. So in our houses, whether small huts or large mansions,

whether in a hot climate or in a cold one, if we are wise, we shall make use of this knowledge bought for us by the experience and thought of our ancestors, and shall consider ventilation as of first importance.

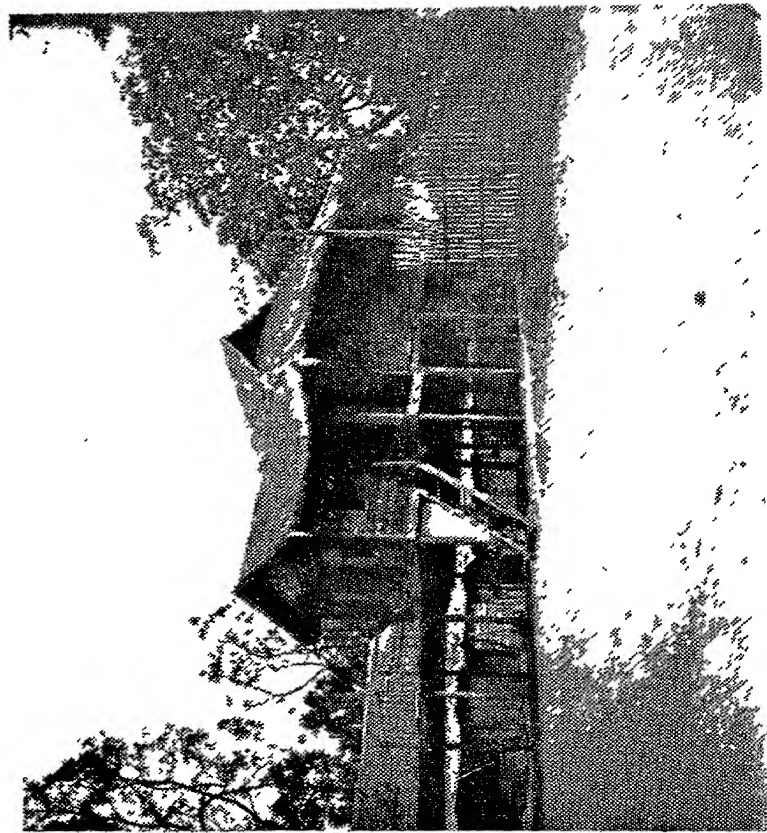
At the same time men learned that garbage and dirt left lying inside or outside the dwelling produces various forms of illness and disease, and also that stagnant water and damp vegetation breed large numbers of mosquitoes, many of which inoculate mankind with that fever from which millions of people die every year. Never was the lesson about cleanliness and fresh air more forcibly impressed upon a people than in the case of the great plague of London which broke out in the crowded and dirty city 250 years ago and soon carried off over a lakh of people, nearly half its population at that time; after which the city was purified by the great fire which destroyed over 13,000 houses and many public buildings. By suffering, thought and study our ancestors have won for us a knowledge of the laws of cleanliness of person, dwellings and surroundings, which is of priceless value in our lives to-day. Much of their experience is stored up in the *Silpa Sastra*, which states that house sites should be selected for good soil and water, unobstructed sunlight and fresh air, and beautiful natural surroundings. A quaint story is told of the founding of the small city of Koliyur in South India. It is said that a Chola king was riding through the forest one day when his elephant was attacked by a cock of remarkable

strength and bravery. The king was so struck by the incident that he looked round and saw that all the creatures in that place were flourishing—the soil was good, the tanks were full of lotuses, the fruit and other trees were thriving, and the birds and animals were healthy and strong. So on grounds of health he decided that a city should be built there—a lesson to us of modern days who often put money before health and build crowded cities round coal mines or in swampy deltas.

In the matter of comfort there is much to be said. The home must be a place of rest, a refuge after the strenuous and rough work of the outer world. The labourer, the artizan, the clerk, having arrived home in the evening after an honest hard day's work, should find there beauty, peace, nourishment, and rest. To this end men have laboured to invent thousands of little details of convenience and comfort for the home, which are far more necessary in the West than in the East, where comfort consists mainly in having clean and convenient arrangements for bathing, and a nice courtyard with verandahs round, where the family and friends may sit on clean straw mats and enjoy reading and story-telling, conversation with friends, quiet games and play with the children, or music before retiring for the night. Here again man has learned the dangers as well as the blessings of comfort, that in the interests of health it can only be permitted to those who have done honest work, and



To face page 148] A small Indian Bungalow



A BURMESE HOUSE

[To face page 149]

much advice have the wise given us to seek simplicity and simple beauty, not luxury, in our homes.

Much progress has also been made in the appearance of the three main parts of dwellings, that is in beauty of interior, beauty of exterior, and beauty of surroundings or gardens. In all this the Indian tradition has ever been in favour of the simple, neat, excellent and sufficient, not the gorgeous, striking ornate and excessive, as far as private dwellings are concerned. Any attempt to dazzle the beholder has ever been considered in bad taste ; yet everywhere should be seen that simple beauty of form and ornament which marks out the owner as of a heart and mind that are fair and gracious within.

CHAPTER IV

TEXTILES AND DRESS

PEOPLE have sometimes thought 'that man has much to complain about because he is not protected and ornamented by Nature with a covering of hair, wool, feathers, scales or thick hide, as are his companions of the animal world. Yet it is that very fact that has enabled him to spread his species throughout the earth, and make himself at home in the frozen lands of the north, in the torrid zone about the equator, and in the temperate regions that lie between. He provides for himself his own clothing, adapting it to the climate in which he lives and to the ideas of beauty that he has attained, and this gives him a field of exercise for his thought and skill. Only in the most extreme polar regions and in blazing waterless deserts has he been unable to settle and live.

It is said that many of the earlier of the European merchants who came to India took to the light loose clothing and turbans of the inhabitants as being eminently suitable for the hot weather, and in this habit, which they have long abandoned, they showed a high sense of fitness and beauty, softening racial



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Buildings in Shanghai



WORKMAN'S DRESS—SOUTH INDIA [To face page 151]

antagonisms and bridging many social gulfs which at the present time are growing wider and wider; while acknowledging protection of the body, cleanliness, comfort and beauty to be the true use of clothes. In such a climate only the thinnest of light clothing is necessary for the Aryan, white or brown, and all that the non-Aryan needs, with his coarser skin and plentiful pigment derived from ancestors who have lived in the torrid zone for hundreds of thousands of years, is the minimum of covering required for decency and adornment. Some primitive tribes of Australasia and Africa neglect clothing altogether except in the case of their chiefs, who wear a piece of matting and sometimes a brightly coloured belt. There are tribes that wear clothing made of the inner bark of trees, beaten out with mallets, stamped with patterns, and coloured with vegetable dyes which are first spread on leaves and then pressed on the cloth in order to print the design. Some of these unwoven bark cloths are covered with varnish and thus made waterproof, while others are still further ornamented with feathers, bones, beetles' wings and other objects sewed on. Excellent cloth is thus produced, and the finished product involves a series of inventions which must mean much to the people who use this unwoven cloth.

The ancient cave and lake dwellers used the skins of wild beasts, the wool of sheep and the hair of goats, and their primitive cloths were fastened by pins and

buttons and sewn together with linen and bark fibres by means of bone needles. In our own day the Eskimo and the Laplander still wear furs, which are also an important part of the winter clothing of many northern peoples, and of European ladies who wear them for both warmth and ornament in winter. There is now a movement of opinion against the wearing of furs and feathers, because they are largely obtained with cruelty to animals and birds.

Textiles are woven fabrics of all kinds, and their manufacture generally involves two remarkable inventions, spinning and weaving, which were known in remote times. In the first, the vegetable fibre, hair or wool, is twisted into yarn by means of a spindle, which was at first merely a stick rolled on the thigh, and then a weighted stick which was twirled against the thigh with the right hand and allowed to spin in the air while the left hand held the fibre. Later came the spinning wheel. The second, when it goes beyond mere hand weaving or knitting such as is used for baskets and nets, requires the use of the loom, which was known in most ancient times, though the flying shuttle (which was a great invention) is not to be found in primitive looms. To one or other of these two arts, spinning and weaving, we owe not only all kinds of woven cloths, but also thread, rope and string and such articles as straw mats, straw hats, baskets, tents, carpets, bags and nets.

India was the first country to perfect the art of weaving, and her cotton fabrics, calicoes, chintzes, muslins, silks, shawls and carpets were world-famous for hundreds of years. Indian cotton cloths are still as good as any in the world, but they are declining because they cannot be sold as cheap as the inferior factory-made imported goods. In the craze for cheapness instead of excellence much of the old skill and knowledge is being lost—the huge trade of Dacca in marvellously delicate muslins (which were called by such names as ‘running water’, ‘woven air’, and ‘evening dew’) has almost gone, and the famous shawls of Kashmir have become much inferior since the introduction of European dyes and designs, as have many other textiles of this country which led the world for excellence of material, workmanship, dyes and designs. Here is a case where the purchasing public have not valued the attainments of their ancestors and encouraged modern weavers to preserve them and carry them on.

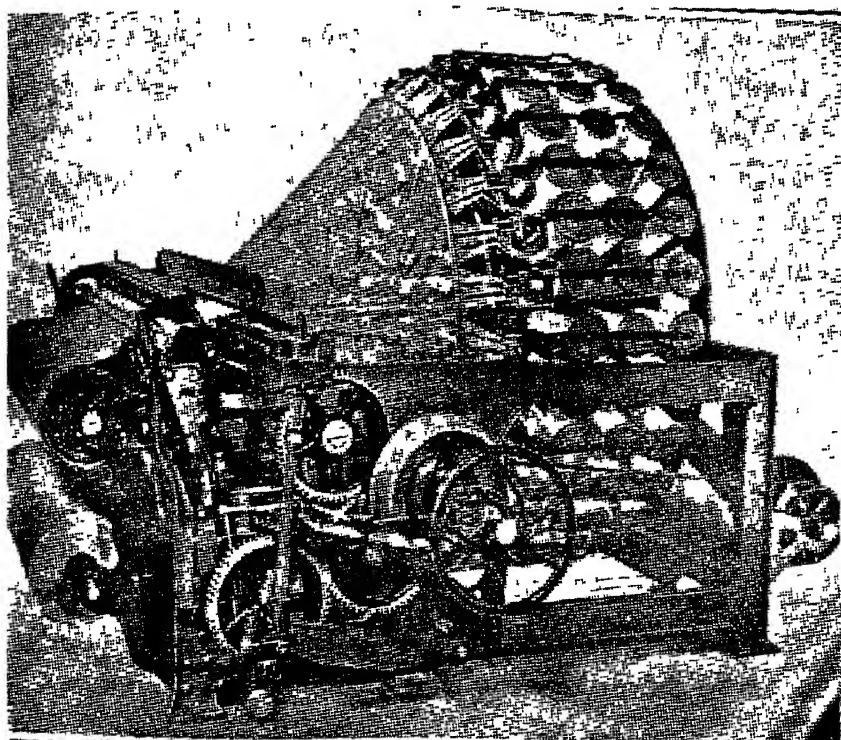
About a hundred and fifty years ago there began to come over the industries of England a series of changes so great and so rapid that it has received the name of an Industrial Revolution. These changes were due to the inventive genius of a few men who introduced labour-saving machinery into many different trades, among which the textile industry led the way. England had already been enriched by the arrival in the country of many thousands of the best

industrial workers from the continent of Europe—men who had left their own native countries on account of the selfish and cruel tyranny of their rulers. There was a rapid succession of important inventions for spinning and weaving. First came Kay's flying shuttle, which increased the power of the loom, and caused a shortage of spun yarn. Then came Hargreaves's 'spinning jenny', in which many spindles were turned at once by a horizontal wheel, Arkwright's 'spinning frame', that cleaned out the wool, rove it into a thick soft thread, spun it into yarn, and produced by its rollers yarns compact enough to be used for weft as well as warp, that is for the shuttle-carried threads that run across the cloth as well as for the threads that run along, and Crompton's 'mule' which combined both the previous inventions and could spin delicate yarn with great rapidity. These inventions reversed the previous condition of affairs, and now there was too much spun yarn and there were not enough looms to use it up. Then Cartwright invented the power looms driven by means of steam engines.

Hargreaves, Arkwright and Crompton were all Lancashire men—the first a poor mechanic, the second a barber and hair-dealer when a young man, the third a poor cotton worker who died in poverty and sickness of heart. They all suffered greatly for their priceless gifts to mankind. The hand-loom workers attacked them in mobs, smashed their machines and

pulled down their buildings, and their inventions were stolen by rich men, who also tried to ruin them by means of extensive malicious litigation in the courts.

Three other inventions must be mentioned before we leave this point—the Jacquard loom for weaving figured designs ; the sewing machine on which a series of inventors worked patiently for fifty years before it was brought to some degree of perfection by Howe in America ; and the wonderful new looms for diagonal weaving brought out in the same country. Such has been the labour-saving power of these inventions



DIAGONAL LOOM

that one of our present day looms will do the work of a hundred women workers on the primitive loom, and one well-equipped factory can weave more cloth than ten thousand expert hand-loom workers. Is it not strange that the comparatively few people in the factory, who are turning out the work formerly done by ten thousand experts who were comfortable and wealthy in their own way, should be working under bad conditions in a state of miserable poverty, with no spare time, energy or money for the comforts and refinements of cultured life?

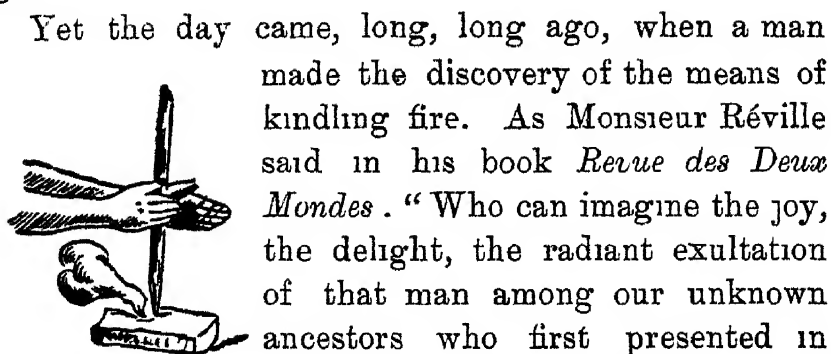
We may not close this lesson on textiles and dress without some allusion to fashions. These are sometimes dictated by occupation, as the oil-skins and rubbers of the deep-sea fisherman and sailor, the leather suit of the aviator, the furs of the Eskimo, the khaki of the soldier, and the feathers and frills and paint of the North American Indian—the last two being examples of camouflage, to render the wearer less noticeable amid the mud of the battle-field or the variegated vegetation of the forest. Orna-mental clothing has always had three aims—beauty, camouflage, or to signify status or office. Ideas of beauty differ very much in different parts of the world and at different times, but in all cases, whether crude or polished, we can see therein a portion of man's striving through beauty towards spiritual things.

CHAPTER V

DISCOVERY AND USES OF FIRE

NEVER was the time or the country, so far as our knowledge of the past extends, when men did not make use of fire and regard it as one of the most divine things of life. Everywhere has man worshipped it as a most wonderful manifestation of God, and recognised its utility under various forms—in the glorious life-giving splendour of the sun, in the electric spark of lightning, in the glowing rock and shining clouds of the active volcano, in the huge forest fires kindled by lightning or by the rubbing of hot branches or bamboos in the wind, in the fire-fly and the glow-worm, in the warm breath and blood of animals and men, and in the humble fire for his cooking which man first obtained from some volcano or some forest fire before he had yet discovered the means of awakening fire in wood or stone. In those ancient days some brave men must have approached the volcanic lava or burning forest and obtained the fire, which was then passed on from family to family and tribe to tribe, and guarded

with the most jealous care, so that it might never go out.



HAND FIRE DRILL

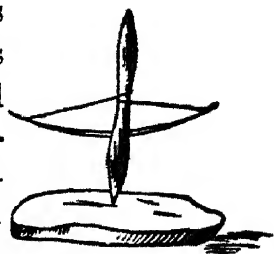
Yet the day came, long, long ago, when a man made the discovery of the means of kindling fire. As Monsieur Réville said in his book *Revue des Deux Mondes*. "Who can imagine the joy, the delight, the radiant exultation of that man among our unknown ancestors who first presented in triumph to the astonished eyes of the bewildered tribe the smoking staff from which he had succeeded in producing a flame?" All the early inventions were different forms of rubbing together two pieces of dry wood until fire appeared, first as heat, then as a glow and next as flame. There was the fire plough in which the end of one stick was rubbed in a groove made by it in another; the fire drill, in which the hands rapidly revolved to and fro a pointed stick standing in a hole in another piece of wood; the bow drill, in which the pointed stick was turned by a bow string, and



FIRE PLOUGH

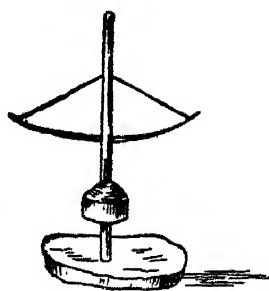
the pump drill in which the bow is pulled up and down instead of being drawn from side to side. Then came other methods for producing sparks—the striking of flint stones against each other, the striking of flint against steel or iron

pyrites (an ore containing iron and sulphur), and the banging together of bamboos (as in China) When the spark was thus obtained and allowed to fall upon dried wood, bark, leaves or charred substances, how carefully it was nurtured by the gently waved hand or the breath until it grew and burst into flame. The



BOW FIRE DRILL

new discovery was then made that more air, not too windy, would assist the kindled spark to become flame; and this led to the invention of fans (which were not at first intended as instruments for cooling us by artificial breezes), the blow-pipe of the cook and the scientist, and the bellows which we can see every day in our blacksmiths' shops Still more scientific inventions were the burning-glass, used by the priests of old Peru, and known also in India (you will find it mentioned in *Shakuntalā*), the system said to be used by the Malays, in which fire is produced by the compression of air in wooden or ivory tubes, and in our own day matches and the electric spark.

BOW DRILL WITH
FLY WHEEL

Only eighty years ago the most civilised man kindled his flame from flint and steel or the burning-glass, and so much trouble did this entail that when young people married and started their household fire they

used to keep it burning throughout their lives. Meantime the chemists had been making great strides in their researches, and one of them discovered phosphorus, and found that he could get a flame by rubbing it between two pieces of brown paper, and that this flame would easily light a stick which had been dipped in sulphur. That was nearly two hundred and fifty years ago, but strange to say it did not occur to anybody to bring this knowledge into general use. About a hundred years ago another discovery was made—that a white substance called chlorate of potash mixed with lumps of white sugar took fire when merely touched with sulphuric acid. This time the invention was put to practical use, and soon you could buy for the equivalent of ten rupees a pretty little metal case containing a hundred match sticks with heads of sugar and potash, with some acid in a little bottle. This was expensive, and moreover not very successful, for the acid often became watery and useless. But ninety years ago a chemist invented the friction match, which has gone through several changes, and is now composed of phosphorus to give the flame, some substance that can supply oxygen to feed it (as a fan feeds a fire with the oxygen of the air), sulphur to keep the flame going till the stick is alight, and gum or glue to keep the head together in a little mass. In the case of safety matches some of these things are in the head of the match and others in the friction paper which is glued on the outside of the box.

As in our own days one invention or discovery helps forward another (like the kite and the aeroplane) so did that of fire lay the foundation for hundreds of others, from the prehistoric discovery that by means of cooking many forms of food can be made more pleasant to taste and softer to masticate, to the invention of the steam engine in which the powers of fire and water are united in our service. Almost every tribe of primitive men learned to cook, but it was some time before the use of boiling water came in. At first the cooking was done by means of hot stones placed in layers along with the food to be cooked, then by means of water, when hot stones were dropped into holes lined with skin or into wooden vessels containing food and water. In our times the discovery of the power of expanding steam rose from the observations of a cooking pot (a kettle of water set to boil upon the household fire) by a clever young boy. Fire served other domestic purposes also; giving light at night, and warmth in cold countries by night and day. Even to this day in cold regions the household fire is generally the gathering place of families and friends, where all sit together talking, playing or reading, happy and at home—though invention has changed the face of the fire in modern Europe and America, where stoves of glowing gas, hot water pipes, or electrically heated wires are used in the richer houses.

Industrial as distinguished from domestic uses of fire were also practised from the earliest times, when men cleared away whole forests by fire (a distressing waste),

hardened their pointed digging-sticks, burned out hollows in logs to form primitive boats, and afterwards smelted their metals and baked their pottery and bricks. What marvellous progress has been made in the smelting of metals since the first clay furnaces were built down to this day in which there are thousands of huge furnaces capable of turning out iron and steel by hundreds of tons, and in which discovery after discovery has been made of new forms of fuel (wood, coal, oils and gas) and we have reached that marvellous invention the electric furnace, by which we transcend altogether the use of fuel, and have fire in the form of glowing incandescent wires, etc. Thus do we convert into the form of fire the other four forms of matter—solid or earthy, liquid or watery, gaseous or airy and etheric or skyey. Most marvellous of all, we can get fire without burning anything when the electric power is drawn from the sun (by what is called a thermopile), from the swing of the tides, or the fall of water, like that of the great Falls of Niagara, where there is an enormously powerful electrical station which can give power for the electric furnace. What power is man's, and alas how often has he used it for harm, in the manufacture of death-dealing guns, proving the danger of power and knowledge where men are not full of the emotional virtues, affection, friendliness and sympathy!

CHAPTER VI

THE STORY OF LIGHTING

Of all our senses vision is the most precious. Safety, comfort, enjoyment and progress all depend mainly upon it, and our thought-pictures or mental images are almost entirely based upon things seen, to the comparative exclusion of things heard, tasted, smelt or touched. Without three things, light, sources of light and the sense of sight, our life would be fearfully restricted, for nine-tenths of our experience and nearly all our knowledge comes with their aid. With them we enjoy a sense of space, for we can see hundreds of things about us, near and distant, and can judge how they are situated with reference to one another. Neither hearing nor smell could present us with this rich world of experience, and to be blind would be to be almost dead, were there not companions who could see. It is by means of the sun that we see, for it sends out rays of light which fall upon the earth and its objects and upon the particles of air that surround the earth, and light these up in such a way that the interrupted rays reaching our eyes excite the sense of vision. Without the sun and the

rays of light in the ether we should be in perpetual night, unless indeed we were endowed with other organs instead of eyes, which would be useful to sense electric or other rays by which we cannot now see. If we could see by electric rays, for example, a new and still richer world of experience would be opened before our vision, because electric waves penetrate where light waves cannot go.

The sun shines upon our part of the earth by day, and we receive by night a little of its light reflected from the moon and the planets. The stars also give us of their light, but so distant are we from their radiant centres that, though most of them are probably brighter than our sun, but little of their light falls upon the earth. Other occasional sources of natural light are lightning, volcanoes, the phosphorescence of glow-worms, fire-flies and the millions of minute creatures that play upon the surface of the sea, and natural fires such as burning forests or oil-wells. But man, desiring the blessings of sight by night as well as day, for the sake of safety, convenience and enjoyment, has invented artificial sources of light, which range from the small fire to the electric lamp, by which the streets and houses of cities are often illumined almost as by day.

The lights of savages and primitive men are for the most part simple. In middle America the primitive people imprisoned fire-flies to light their huts. Others used little fires, and others again burned nuts

or the fatty knobs of pine trees, or torches, which are sticks whose ends have been dipped in the resinous gum that exudes from certain trees. Next we come to manufactured lamps, which mark a distinct level of discovery and invention, such as the little saucer lamp of fatty oil with a bark or cotton wick, and the rushlight and tallow or wax candle which is the same sort of thing, but with hard instead of soft fatty matter and a rush or cotton wick. In days prior to the invention of clocks and watches candles were often used for keeping time.

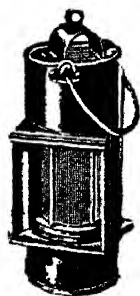
This brings us down to very modern times, when a new era in lighting came in with three inventions—the lamp chimney, the gas burner and the electric light. Petroleum or kerosin was known in China and Japan and among the Jews and other ancient peoples long ago, but as an illuminant it was not a success (for it burns with a dirty, smoky flame) until, nearly sixty years ago, Colonel Drake in America invented the lamp chimney, which sucks in from below a rich supply of oxygen, as the hot burnt gases rush through the top of the glass tube. Colonel Drake had bored into the earth and found mineral oil—petroleum or kerosin. Several wells were dug, which all yielded richly and then become dry. But in 1861 he struck a fountain well from which oil rose to the amount of 2,500 barrels every day. This was indeed riches greater than gold, and men in their hurry to become rich deserted the gold fields of California in the West

and rushed to the oil wells of Pennsylvania in the East, and to this day the expression "He has struck oil" remains in the English language to describe a person who has met with sudden success leading to wealth. It was through this oil that Rockefeller became the richest man in the world. He worked on a farm till he was sixteen years old, then in an office for several years, after which he took to the oil trade in which he became a millionaire in a few years. Ponds of oil were discovered a little later on the shores of the Caspian Sea; here were natural wells and fountains that hurled millions of barrels of oil into the air, and people were soon busy putting caps on the wells, digging ponds to capture the oil, sorting out the different kinds of oil and refining them for use in lamps and for other purposes. But it was with the help of Colonel Drake that all civilised men began to enjoy this natural wealth

In America some use had also been made of natural gas, which was found issuing from the earth; the gas was enclosed and conducted through pipes to light roads and houses in the neighbourhood. It was also discovered that by heating coal in closed chambers an excellent gas could be obtained, and presently in almost all the large towns of Europe and America gas installations were set up for lighting the streets and supplying gas through pipes to the houses, in which oil lamps were soon discarded in favour of the cleaner, more convenient, and superior light. For its success

inventions were again necessary—first the open burner giving a flat yellow flame, and then the far more powerful and economical glowing or incandescent burners in which the gas fills a little woven mantle which glows all over with dazzling brightness. Gas lighting has not become general in India on account of the inconvenience and expense of procuring coal.

One may mention here a story of wonderful courage in connection with the invention of a safe lamp for the use of coal miners who have to work deep down in the darkness of the earth, often amid gases liable to explode on the approach of a naked light, so that many lives were lost. Sir Humphry Davy invented a little lamp in which the flame was imprisoned within gauze, which was expected to keep it from the gas, and then a heroic friend of his took the new lamp and went down into a dangerous mine in order to discover whether he would be blown to bits or buried alive by falling rock, or would perhaps prove the success of the life-saving device, as he happily did. There are three other forms of gas light which are of special use for the lamps of motor cars and cycles or for brilliant and special illumination, such as that required for magic lanterns, cinematographs and theatres where electric light is not available. One is acetylene gas, another oil gas (as in the Washington light), and the third is the lime



MINER'S
SAFETY LAMP

light, which is produced by a mixture of oxygen and hydrogen burning within an incandescent block of lime.

It is impossible to overestimate the value of closed lamps in our civilisation. Trains and motor cars dare not travel without them, and ships would collide at sea ; and but for the lighthouses on our cliffs and shores many ships would be wrecked by running aground.

But the electric light is the greatest achievement. Here we have perfect cleanliness and entire absence of smoke, inexpensive fittings and a brilliant glow of steady light. Above all it is convenient for the householder who has only to press down a little knob when he wants his light, and for the streets of a town where hundreds of lights can be switched on or off in a moment, and there is thus no need for a lamp-lighter to go round from lamp to lamp along the streets with his ladder or long torch. The electric light is simple and cleanly to produce. Coils of wire revolving between powerful magnet poles send round the circuit a current of electricity, which passing through the fine threads of the little glow lamps causes them to become highly incandescent, or passing through the air gap between the two pencils of carbon in the arc light causes a large and brilliant glow. This light is now used for both streets and houses in all large towns.

In addition to all these we have the invention of curved mirrors, lenses and prisms for concentrating

and directing light from lamps, and where sight is defective the marvellous invention of spectacles ; while for seeing at a distance we have the telescope, and we have the microscope for seeing the small.

All these details show us that our progressive ancestors have not rested content with partial success in their striving for improvement in every detail small and large—from the huge machinery of the coal mines and gas works to the tiny hole of a burner, they have worked to make our lives clean, comfortable and safe.

CHAPTER VII

THE WHEEL

The expert charioteer stands on his chariot and drives his horses wheresoever he will. The reins restrain the horses from behind. Sing of their glory! The horses raise the dust with their hoofs, and career over the fields with their chariots, with loud neighings.

Rig-Veda, VI, 75

THE first dawn of history lights up for us a world of human activity in which the wheel is already playing a part. It is mentioned in the *Rig-Veda*, and was brought by the Mongols (who used it for locomotion and water-lifting) to Babylonia and Egypt, whence it passed to Greece and Rome and on to modern Europe and America. Yet there was a time when pre-historic man did not know it, and the first appearance of anything in the nature of a wheel seems to have been in the weighted fire bow-drill, where the weighted portion acts somewhat as a balance wheel and a fly-wheel.

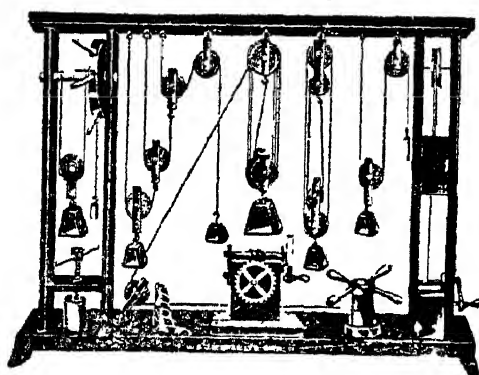
It is impossible to estimate the great part that the wheel now plays in our civilisation, for there is scarcely any object in our lives which has not had something to do with a wheel. 'Indeed, as I write

this and look round my house at books, papers, clothing, food, tools, and the very materials of which the house is built, I cannot find one little thing which has not been either made by the aid of wheels or carried upon them. We will merely glance at several different uses of this invaluable invention.

1. For work in which the object has to be twirled, we have the fire drill already mentioned, with its alternating motion produced by the string drawn first in one direction and then in the other; also the carpenter's drill on the same principle. Potters of some primitive tribes placed their work in round-bottomed baskets or dishes which they turned as the work went on, while in the interior of China there are potters who still turn their revolving tables with one hand while they work with the other. In India, the horizontal potter's wheel or whirling table has been known from most ancient times, and it now appears in three forms. the heavy wheel which is set going by hand and spins steadily for a long time on account of its weight, the wheel moved by an assistant with strings that give it an alternating motion, and the wheel which has round its axle a continuous belt, which passes round the assistant's driving wheel and gives the whirling table a continuous rotation in one direction. Other examples are the spinning wheel; the stones for grinding rice and corn, and those for sharpening knives; the wheel that carries the belt of pictures through the

cinematograph; and the lathe, a machine-tool which spins rapidly while holding articles of wood, brass or other metal and trimming them to shape, as in the case of turned table and chair legs. We have also machine borers or drills that can pierce an inch of steel almost in a moment.

2. For lifting objects we have the various water



VARIOUS PULLEY WHEELS

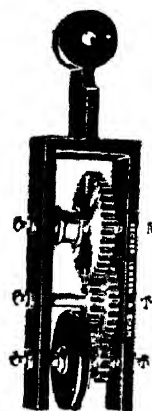
wheels; the simple draw wheel of the well; the wheel and axle which lifts a greater weight more slowly; and the Persian wheel drawn by camels, bulls or horses, which is geared to a

belt of buckets or pots which rise in turn to the top, pour out their water and descend again. On the same principle there is the windlass which winds the rope passing round the pulleys of the derrick crane, and the capstan of the ship, which is turned round by the sailors or by the power of the ship's engines in order to raise the anchor. An interesting example in this class is the endless belt which is sometimes used in the West for serving a great many diners or for carrying small articles in manufactories; in this case the belt runs along the centre of a long table and carries food to perhaps a hundred diners, who serve themselves as it passes by. Other curious examples are the travelling

roadways and travelling stairways for foot passengers—you simply step on the revolving belt of the road or stairway, and you are carried up or down or along to the other end without exertion on your part. All such belts run upon wheels and are in a sense wheels themselves.

3. For transport there were at first rollers, which were slipped under a heavy stone, a boat or other object as it was pushed along. Then came the pair of cart-wheels with their axle bearing the load, for use on land; and for the sea the paddle wheels that beat the water (just as in a water mill the falling stream beats on the paddles of the wheel and so turns it round) and the screw or propellor fixed at the stern of a vessel to force it along when its sloping blades are revolved so as to push against the water like a revolving fan.

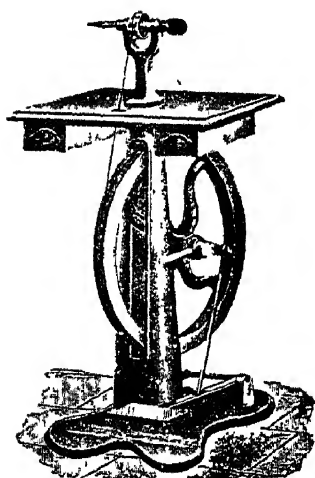
4 For transmitting power from your feet to the back wheel of a bicycle, and also to increase the speed at the expense of power, there are the gear and hub wheels with the chain that runs round them and causes them to work together. Some motor bicycles and other machines have rubber or leather belts instead of chains. Quite similar are the toothed wheels in clocks and watches which fit into one another and transmit to the hand or fingers the power of the spring,



TOOTHED GEAR
WHEELS

and all the various toothed wheels that play so large a part in modern machines of all kinds

- 5 For converting the to-and-fro motion of a piston, which throbs in a cylinder by the force of steam or other power, into the turning motion of a wheel as in the locomotive engine, we have the crank, which is fastened on the wheel well away from its centre so that when the piston has reached its end the wheel may go continuously round as the piston returns, instead of turning back.



TREADLE LATHE

Exactly the same principle is to be seen in the foot treadle of the spinning wheel, and of the sewing machine and lathe that are worked by foot power. Where the process is reversed and the rotation of a wheel is required to move something up and down, such as a needle or a valve, a little knob or swelling called a cam is fixed upon the wheel so that it gives a push every time that the wheel turns round.

6. The heavy fly-wheel which you see on the side of an engine is intended to make the machine turn steadily and to carry the crank over its dead end when the piston has completed its stroke. The wheel appears again in the form of rollers for making sheets of paper, for squeezing the water out of cloths

that have been washed (in what is called the wringing machine or mangle), and for rolling metals such as



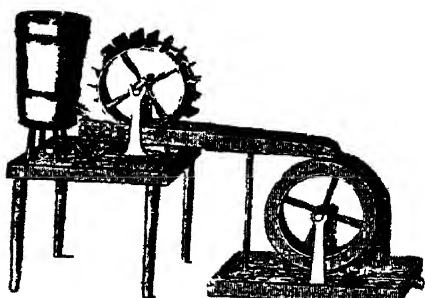
SCHOOL ENGINEERING WORKSHOP (ANDHRA JĀTĪYA KĀLĀSHĀLĀ)

iron and brass into sheets of different thicknesses. Among the strangest forms of its use is the centrifugal separator, which is a development of a familiar experiment. You know how you can whirl a can of water round your head without spilling a drop ; so in the centrifugal separator, liquids are whirled round rapidly on a stand and the result is that any heavy matter which is suspended in the liquid is thrown to the bottom ; thus muddy water, for example, can be made quite clear in a few seconds, for the mud is thrown outwards to the bottom of the whirling vessel.

It has already been mentioned that the roller was the first form of wheel for transport. Then came the solid wooden wheel with an iron rim, as used even now in many parts of India for carts which carry heavy stones from the quarries. Next came the wheel with spokes, which is made immensely strong by iron rim which is forced on to the wheel while hot and then becomes' smaller and contracts as it cools and grips the spokes in place with enormous force. The latest wheels for use on good roads are those with pneumatic tires, which are rubber cushions filled with compressed air ; while for farm tractors and other such machines the wheels are provided all round the tire with iron feet or treads, which sometimes move in sockets and fall flat on the ground as they go round. The famous 'tanks' which are intended to go over broken ground however bad run on an endless chain on wheels.

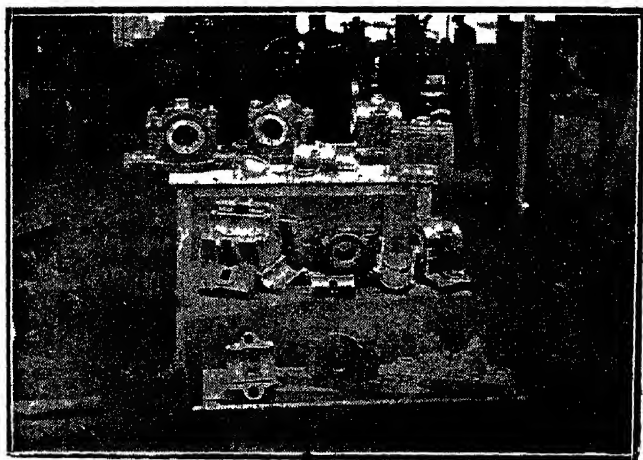
The story of the pneumatic tire is interesting. The inventor, Thomson, brought them out over seventy years ago, but they did not come into general use until after the bicycle was invented. It was soon shown that the tire not only saved bumping and jarring, but also that a carriage fitted with them could be drawn with less than two-thirds the effort or power required to pull the same carriage with iron tires, even on a smooth road. Thirty years ago Dunlop experimented with inflated rubber tubes bound on to the wheels of his little son's tricycle by means of tape, proved the success of the idea and patented it. As the business progressed the idea was constantly being stolen and there was much litigation over it, so that at one time there were no less than 162 suits pending in the courts. Many small improvements were brought out from time to time by different inventors, including various forms of rubber and web coverings, and the world's trade in rubber tires has now reached the enormous annual sum of nearly Rs. 2,000,000,000.

Wheels are turned by all kinds of power, the human hand or foot, water (in the water-mill), wind (in the wind-mill for grinding or for pumping water, steam, gas and electricity.



WATER WHEELS, UNDERSHOT
AND OVERSHOT

Every visitor to a large modern factory or engineering workshop must stand amazed, as in the presence of the greater phenomena of Nature, at the bewildering maze of whirling wheels, belts and shafts, all probably connected up with one large steam-engine



ENGINE PARTS MADE BY BOYS

which works hundreds of machines. Behind all this labour-saving machinery, designed for the convenience, comfort and safety of mankind, lie the unseen endeavours of thousands of our aspiring ancestors.

CHAPTER VIII

LAND TRANSPORT

ENORMOUS strides have been made in human achievement in the field of travel and transport since the days of the Stone Age, when men walked and carried their own burdens by land, even long after they had invented the canoe and discovered the convenience of water transport by river, lake and sea. Now the world is girdled with a network of railways and steamer routes, which make a journey round it by land and sea a matter of but five or six weeks, while the roads are thronged with riding and pack animals, carts and carriages of all kinds, bicycles, motor-cars and electric trams, and so great is the gain in transporting power that one of our railway trains can do as much work in a day as half a million men carrying loads on their backs in the same period. Such power ought to be of incalculable service to all mankind, and every man ought to be reaping rich fruit of ancestral planting, when men learn to use it for the common good. Yet even now, in our struggling civilisation it is increasing the comfort and convenience of all, and making almost every human life richer for the variety that it brings.

By it goods are exchanged throughout the world, and men, seeing the products of other lands and other minds, are stimulated to imitate or to improve, while the whole mental nature is brightened up as the varied activities of the world are brought within its reach.

In this department of life, as in every other, we owe discoveries and inventions to those men whose minds have been wide awake, free from that tamas of prejudice which always looks backwards instead of forwards mentally, who have willed to go forward into an unknown future with courage ready to face the difficulties and dangers that must be encountered and overcome, and with what is really spiritual faith that such difficulties will give way before the power of man, and that man will be the stronger for having faced and conquered them.

We may consider modes of land transport according to the power employed; first human, then animal, steam, gas and electric power. Among the inventions brought out to increase human carrying power are the staff, the yoke, the forehead band and the pocket; and to assist the walker in rough or thorny ways or in burning heat or snow we have the moccasin, sandal, shoe and boot, which have now become fashionable in some countries and are worn when they are quite unnecessary. For collective work in carrying we have the chair or palanquin, or baskets borne upon poles. Of wheeled inventions there are the wheel-barrow

and the hand-cart. The latter is still used for heavy loads in Madras and some other Indian towns—a practice which would be regarded as a disgrace to humanity in any other civilised part of the world. As invention proceeded there came the domestication of the dog and other animals which were in due course compelled to carry panniers of goods on their backs, or to draw sledges, carts and carriages with wheels, and highest of all the stage coach, which was looked as a marvel of expedition a hundred years ago, for by its means it became possible to travel with frequent changes of horses between fifty and a hundred miles a day, a tenth of the distance now covered by a good railway train. Of machines on which man rides by his own power, the bicycle, thirty years old, is the only survivor for practical use. Its predecessors were the velocipede in which there was no chain, but the rider sat over the front wheel and turned it direct with pedals, and a smaller machine with no pedals at all, which the rider propelled by paddling the ground with his feet. One form of machine was the roller skates, by which the rider could glide with great speed upon small wheels fixed under the feet—an arrangement which has survived only for amusement.

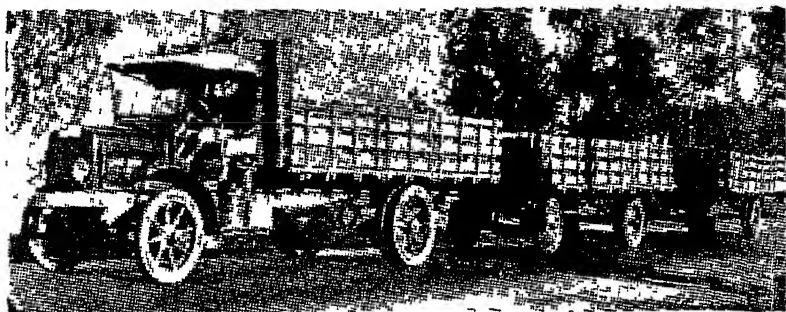
Almost exactly a hundred and fifty years ago James Watt invented the double-acting steam-engine, by which steam generated under pressure in a boiler is led into a cylinder first at one end and then at the other, so that it forces a piston to run

to and fro in the enclosed space. The piston is attached to a rod which turns a wheel, which may in turn move other wheels geared for very many kinds of work, such as running the machines of a spinning and weaving factory or raising water from mines. For the latter purpose a simple steam engine was used fifty years before Watt's invention. Over two thousand years ago an ancient scientist named Hero invented a machine which revolved by steam, and many others experimented with the power from time to time, but it was Thomas Savery who first made practical use of it in 1698, and Papin who in 1690, invented the single-acting piston and cylinder, in which steam strikes the piston on only one side, waits for the piston to return, and then strikes again.

About the year 1800 traction engines were made to run along the road by steam power, and year after year inventors worked at the railway locomotive until George Stevenson invented one that could travel swiftly and draw a heavy load. He was the engineer of the first high-speed railway trains, which ran between Manchester and Liverpool in 1829 and were rapidly copied throughout the world. They have been greatly improved and can now be built quickly in large numbers. In 1918 the people of the United States of America were building railway locomotives at the rate of 30 each day. Until recently the Europeans have clung jealously to all railway construction work in India, but the new railway in the Mysore

State was built entirely by Indian engineers and workmen, including bridge work and tunnelling ; and on the new railway constructed by the Travancore State the very difficult work of bridging bogs and lakes was carried out by Indian divers under the direction of an Indian contractor.

For light and heavy traffic on the roads the steam locomotive has never come into general use, but we



MOTOR TRUCKS IN TRAIN

have motor bicycles, motor-cars, motor buses and motor trucks by the million, almost all propelled by the oil-gas engine. This engine also has a piston and cylinder, but the fuel is oil-gas mixed with air. The oil is sucked by the moving piston through a very narrow opening and thus enters the cylinder as gas ; then at the right moment when the cylinder is closed an electric spark ignites the gas and causes an explosion which kicks the piston. The new liberty motor engine has eight hundred horse power, and weighs less than the average horse

Motor traffic is an immense boon on account of its economy, safety, speed, comfort and readiness ;

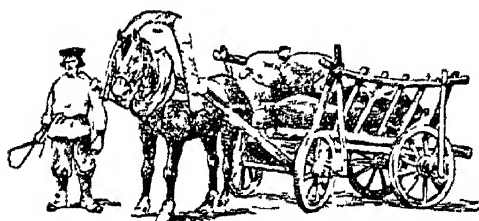
the engine is always ready to work at a moment's notice, with no trouble of making fire, heating water and getting up steam. Where the farmers are prosperous and free from oppressive landlords, and there are to be had mechanics who understand machinery and can do small repairs, the motor tractor on farms is replacing oxen and horses for ploughing, harrowing, reaping and many other agricultural purposes. At present there are in the United States very roughly about twenty million families in a population of about one hundred millions, and it is said that there are four million privately owned motor vehicles, which gives an average of one for every five families or twenty-five persons, including children. In India there are but few, all in the hands of the rich, for we have still with us in this country that terribly crushing idea that the cost of living and therefore the average wage may be kept lower than that of Europe, while every other country is rapidly increasing in individual wealth and opportunity for a fuller life.

Every one who lives in a big town is familiar with the electric tram-car, which receives its power by an overhead wire from an electric station, where the dynamo, with its coils of wire revolving between magnet-poles generates a powerful current of electricity in the circuit. Electric trains for climbing mountains and running through tunnels, as well as for service on level ground, are at work in Europe

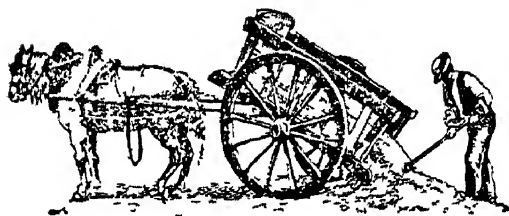
and America, and it now remains to be seen whether this cleaner mode of transport will entirely supersede steam traffic.

For carrying heavy objects a comparatively short distance we have the travelling crane, which is often a Derrick crane combined with a locomotive engine. It has huge grapples or magnets that can lift tons at a time and carry the load from one to another part of the great engineering workshops, or swing it up into the air from the quay and lower it gently into the hold of a steamer. We have already mentioned the travelling road and stairway, and the moving belt that can serve a great many diners or hand-workers. There is the pneumatic dispatch for letters, in use in Germany and other countries, by which light packets and letters are blown with great velocity through an air-tight tube. There are lifts or elevators worked by steam, electricity or the pressure of water, for lifting passengers and goods to the upper floors of high buildings, and for lifting grain into our modern stores. The latter use will be of enormous service in India when the granaries so dear to the ancient kings are revived as a safeguard against famine, and there will no longer be the need for thousands of coolies to ascend a winding stair with loads of grain and drop them through the hole in the roof, for a good engine will do the work of perhaps a million men. Then we have the life-saving rocket line, for carrying passengers from ships wrecked near to land. In this

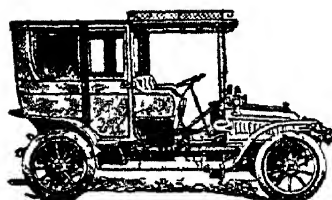
case a line is shot from the land across the wreck and made fast at both ends ; then a basket or cradle is hung from a wheel balanced on the line by means of a grooved rim, and one by one the shipwrecked people are drawn to land.



A RUSSIAN COUNTRY CART



A TIPPING CART



A MOTOR-CAR

CHAPTER IX

WATER TRANSPORT

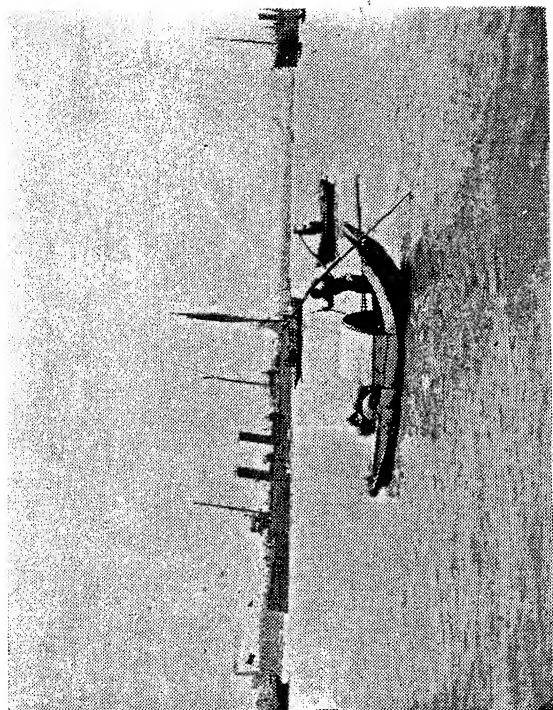
MEN of the stone age were already fully acquainted with the use of boats, which were at first trunks of trees hollowed out with the stone axe and fire, and pointed at both ends or at the front alone. In the later or polished stone age such boats sometimes reached a length of fifty feet, and could probably carry about thirty men. Some American Indian families used until quite recently the dug-out stem of a palm tree, and in this boat goods and children were placed, while father and mother swam on either side, travelling as much as forty miles a day. In very early times boats were also made of skins drawn over frames of wood or basket work. Modes of propulsion developed as time passed, and went through the various stages of poling against the earth at the bottom of the water, paddling over the stern, rowing with oars at the sides, hauling by means of ropes pulled by men or animals walking along a track at the side of the water, sailing by means of wind-power, and, in the immediate past and present, steaming and motoring with engines.

It seems to have been long before the use of the sail was brought in, by the ancient Peruvians, who fitted up on their rafts of light wood two masts bearing a large square woollen or cotton sail, to which they added the inventions of a rudder or tiller for guiding the vessel and a movable keel for balancing it. The sails used by early types of men, which were generally made of matting, were at first employed only for propulsion, while the direction of the boat was set by means of paddles, which no doubt suggested the rudder in course of time. It was only later that men invented the movable sail, by means of which a vessel can tack alternately to right and left of its course (or, as we should say, to starboard and port alternately) and so progress even in the face of a head wind. The swift vessels of civilised man between two and three thousand years ago combined the oar and the sail, the ancient Norse boats and the galleys having as many as three banks of oars. In our own days rowing and paddle boats still survive in the form of canoes, catamarans, row-boats of various kinds for amusement and sport, for convenience in harbour and between ships, and for life-saving and fishing, and canal barges for carrying heavy goods.

In such simple forms of vessels men have covered immense distances. For example the Pacific Islanders have paddled and sailed in their canoes all among their islands, and between Kawaii and Tahiti,



To face page 188] QUILON SNAKE BOAT



Chinese double-pointed boat and ocean steamship
[To face page 189]

two islands 2,300 miles apart. Such an achievement rivals the world-famed exploit of Christopher Columbus, the adventurer who sailed into the Atlantic Ocean from Spain nearly four hundred and thirty years ago, and after much difficulty and danger and opposition from his sailors reached America, which he thought to be India. Before the introduction of steam vessels Indian ships sailed all the seas and were well-known on the Thames, and just lately there has been a great revival of shipbuilding at Calicut and other places on the Malabar coast. Indian seamen are a numerous race; for example, the vessels of the Bombay Steam Navigation Company are entirely manned by Indians of the Bombay coast, while many vessels of the British Merchant Fleet and Government transports during the great war had Indian crews who distinguished themselves for both bravery and seamanship.

An idea will be formed of the benefit we derive from the invention of the steamship when it is realised that some of the engines in our modern vessels can do in a day the work of five hundred thousand to a million horses; or if we compare them to the oarsmen of the galleys, at least five million men would be required to do the same work. It is obvious that no vessel could carry so many horses or men, not to speak of their food and drink for the journey. Yet our gain is not only in power but also in speed and safety, for these huge vessels can travel from India to England in less than three weeks in

almost any weather, while the best of sailing vessels, magnificent as they were, would have taken months to travel the same distance.

As early as 1736 steam was applied to the propulsion of vessels, first in England, and then in Scotland and America, but a number of inventors came and went, and faced the usual opposition and derision, and nearly a century passed before real success was achieved. In 1801 the steamboat "Charlotte Dundas" was used on the Forth and Clyde Canal in Scotland, and in 1812 John Wood built the "Comet", which was the first passenger steamer in Britain. Five years earlier Fulton in America obtained a marine engine from England and fitted it into the "Clermont" which plied on the Hudson river. From this time onward success followed success, and in 1819 the "Savannah" steamed from America to England in twenty-six days—a journey that can now be performed in five. All these early steamers were of the paddle-wheel type, with large wheels beating the water on either side; but in 1839 the first screw steamer, the "Archimedes", was built on the Thames, and now all the large ocean-going steamers have the screw propeller at the stern, except those which have the steam turbine, which came into use in 1901. For many years past all large steamers have been built of iron with skins of steel, but a great number are now being built of concrete, reinforced with iron rods.

Among small craft the motor-boat is now very widely spread, but in the larger vessels steam is far from being superseded, for large vessels can conveniently carry steam engines with more than a hundred times the power of the Liberty motor. The motor is, however, essential to submarine craft, which can travel a great distance under water and remain hidden for many hours. Electricity has not come into general use in navigation, except for lighting purposes, and as part of the motor in which it provides the spark that explodes the gas, because it can conveniently be supplied in quantity only by being generated on the spot with a gas engine or other such power and a dynamo, or by means of trolley wires such as are used to feed the electric tram-car. It can be stored in accumulators, generally in boxes about one cubic foot in volume, but each of these carries but little power in proportion to its own weight. Here is a field of research for inventors of the future.

To assist navigation by shortening the routes, men have cut canals, as for example the Suez Canal, which saves nearly 5,000 miles in the sea journey from India to England, and the Panama Canal, which saves 10,000 miles in the journey between the East and West coasts of the United States. Canals as waterways for inland traffic have been an inestimable boon, and the enormous gain of carrying power by water is appreciated in Germany and other countries which

have kept their canals in constant use for heavy non-urgent goods. A horse that can draw one ton on wheels can pull a forty ton barge from the towing-path. The danger and difficulty of cutting a canal such as the Panama ranks its engineers and workmen among the heroes of industry and invention, for there were great land-slips, and the region was fearfully unhealthy before it was drained. It was a work which called for courage equal to that shown in boring tunnels through the Alps and under the Severn for the passage of railway trains, where falls of rock and floods of water constantly tested the character of the workmen and the skill and insight of the engineers.

Ships of all kinds have always been regarded as among the most beautiful things made by man, on account of their graceful lines. They have always been a favourite subject for the artist and have done much to develop the human soul not only by providing experience and by facilitating and extending communications, but also by stimulating the sense of beauty and the desire for beautiful things in practical life.

CHAPTER X

THE STORY OF FLYING

Stupendous prospect ! Yonder lofty hills
Do suddenly uprear their towering heads
Amid the plain, while from beneath their crests
The ground receding sinks ; the trees, whose stems
Seemed lately hid within their leafy tresses,
Rise into elevation and display
Their branching shoulders, yonder streams, whose
waters,
Like silver threads but now were scarcely seen,
Grow into mighty rivers, Lo, the earth
Seems upwards hurled by some gigantic power

Thus sang the great poet Kālidāsa in the reign of King Vikramāditya at least 1700 years ago, about the sensations of those who were descending in a flying machine, and one cannot but be struck by the remarkable realism and scientific accuracy of the description. To us moderns, riding swiftly in a railway carriage, the objects near seem to rush past us, but those beyond, such as distant trees or mountains, seem to be moving in our own direction. The field of sight in the distance is wider than that near at hand, and a passing object takes more time to cross that larger field, wherefore it seems to move

more slowly; then, moving slowly across the field relatively to the great speed of objects near by, it seems to go forward. So with the mountains of the poet; to the descending passengers the mountain tops suddenly thrust themselves into prominence out of the map that lies below, and for the moment relatively to this the earth seems to sink. Such realistic work in an age when transit was for the most part leisurely and railways were unknown, shows marvellous scientific vision or the continuance of a knowledge handed down from times when men were actually carried in flying machines, as is so often asserted in Hindu tradition.

Whatever the past may have had and lost, the flying machine is with us now, not by ones and twos as a freak of invention, but by hundreds of thousands, ready for practical service, to transport passengers, mails and even light urgent goods to every part of the world with amazing celerity. And the story of its coming is one of human determination and courage without parallel in the history of invention. For the last hundred years there have been men who believed that flying machines were possible, men moved by the irresistible impulse to improvement that comes to the best of men, the genuses of our race, we know not whence, and inspires into its devotees qualities of perseverance and courage that thrill mankind. The flying machine has taken its toll of dead and injured, men who spent their wealth

on their experiments, risked their lives and limbs in carrying these out, and did all this amid the heart-breaking jeers of ignorant and learned alike, for until recently there were not wanting distinguished scientific men who declared their ambition to be both foolish and ridiculous.

A hundred years ago these inventors started experiments with propellers, that is with revolving fans, similar in appearance and principle to electric fans. You know how the electric whirling fan placed horizontally near the ceiling blows the air down with great force; it was rightly reasoned that such a fan if free to move could sustain itself in the air and perhaps lift and carry weights, acting as support for an air-ship. By the middle of the nineteenth century, after many attempts had failed, model air-ships were at last produced which could rise a few feet but usually broke in their descent; yet one of them actually flew across two fields before it fell. It was thus found out that propellers worked by springs and even by steam engines could not be expected to carry their own weight or that of an engine to any height or distance. Then wings or planes were added to the machines, and propellers were placed vertically at the rear to urge them on, and thus the principle of the kite began to give great promise of success. When a boy runs with a kite and pulls the string, it is just the same thing as if a small engine were fixed behind the kite to push it

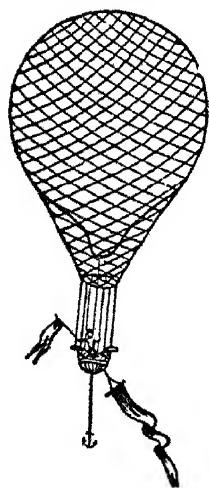
forward ; so somewhere on the aeroplane there is a sloping horizontal rudder-plane (like the sloping face of a kite), and as the engine revolves the propellor and the machine runs along on its wheels, it is lifted from the ground by the rush of air under this sloping rudder or kite face, is sustained in flight by the large planes or wings, is urged forward by propellers and is raised, lowered, steered and balanced by various kinds of rudder planes and fin planes at front, back and sides. But it was only when petrol motor engines both powerful and light were invented and built that the aeroplane in our own century became a practical success.

Among the experiments which were most necessary to success were those of gliding on wings or planes, which were carried on extensively during the last decade of the nineteenth century. With these instruments men jumped off great heights and went gliding through the air (as a piece of stiff paper will glide across the room if you float it on the air) and thus they studied, in peril of their lives, the effects of different air currents, the modes of balancing, and management of rudders. Lilienthal in Germany made over two thousand glides safely, and was then upset and killed in 1896, but others learned from his experience. Pilcher in England made several hundred flights, and was at last thrown over and killed by a gust of wind in 1899. Wilbur and Orville Wright began in America in 1900 and soon

introduced the horizontal rudder, and by 1903 they added a petrol motor to their glider and flew for nearly a minute. Two years later the same brothers made a flight of over 24 miles in half an hour, as well as nearly fifty shorter flights. In 1908 they flew for an hour. Then one had an accident and was seriously injured, and his passenger was killed; but a little later, his undaunted brother flew for nearly two and a half hours. In 1906 Santos Dumont, a Frenchman with a machine like a box-kite, flew over a furlong in a third of a minute. In 1914-18 all kinds of planes came into use in the great war—monoplanes, biplanes and triplanes, with one, two and three sets of wings; and in May 1918 the first mails were carried, from New York to Philadelphia and Washington. Planes that launch themselves from the sea were also invented, and they had the advantage of enabling the flying man to look deep down beneath the surface of the water and see the deadly submarine ships lurking below.

In 1901 Dumont had flown round the great Eiffel tower in Paris in a dirigible or steerable balloon. Men had invented balloons in the eighteenth century. First these were filled with hot air, which rises because it is light, but serious accidents resulted from the fire they carried. Then coal gas or else hydrogen, the lightest gas known, was used, and many brave men ascended in basket cars hung from the huge gas-bags, which were at the mercy of every wind. They

could not be steered, and the aeronaut or air sailor could not generally descend in them, for as the gas



A BALLOON

was let out the falling balloon swept along near the ground and bumped into trees and other objects. So the intrepid adventurer jumped overboard and floated down to the earth with the support of a parachute, which is something like a large umbrella, and often he was seriously injured or even killed in his fall or was drowned at sea. But at length the problems of control and steering

have been solved, and the dirigible balloon rivals the aeroplane for its greater steadiness in flight, its greater carrying capacity, its power of standing still in the air, and its ability to rise and alight without the necessity of a long run.

Like the aeroplane it can climb about four miles, though many light balloon ascents for making scientific observations of the air have reached over

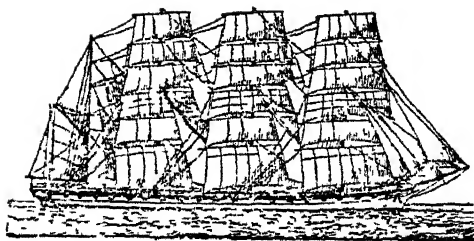
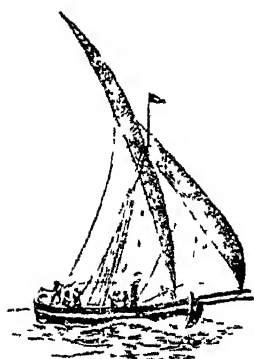


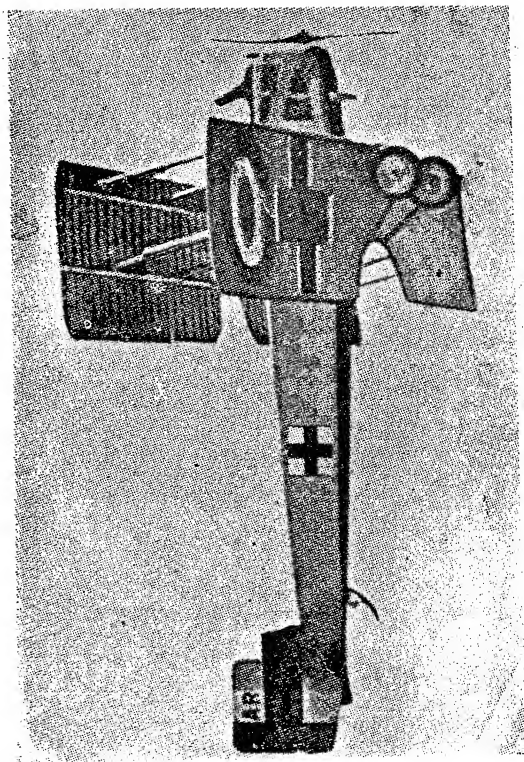
A PARACHUTE of the lighter craft.

six miles, and Coxwell, who made over 700 ascents, went as high as seven miles. The aeroplane has the advantage of speed, 150 miles an hour being well within the power

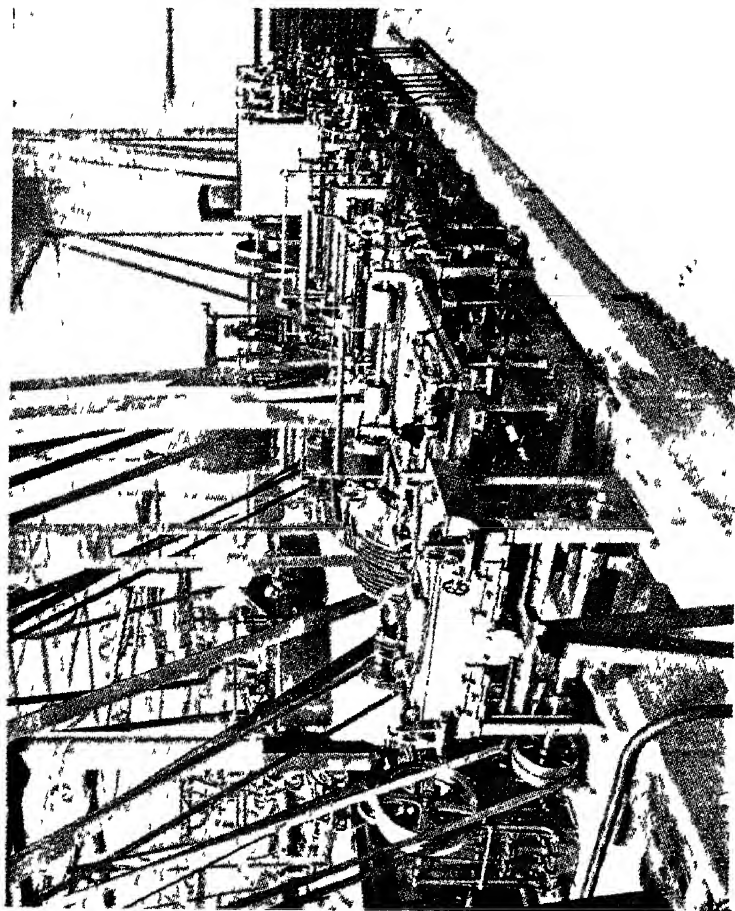
The story of the aeroplane and the dirigible is not yet told. Every year sees new inventions and improvements, more powerful engines and more

perfect balance, and we have not yet discovered that remarkable power of the albatross by which without moving its wings it can overtake a fast steamer, though flying against the wind. In 1918 there were over 30,000 students of aviation in the United States, and somewhat similar numbers in England, France, Germany, Turkey, Italy and other countries, and even little Siam had 500, though India had but a few in the north-west. Among these lakhs of airmen must be hidden the geniuses of the future whose insight and industry will still further advance the science and enrich mankind.





To face page 200] AN AEROPLANE AMBULANCE



A Paper-Making Machine (Manchester College of Technology)
[To face page 201

PART II

FOR THE SENSES AND THE MIND

11. The Repositories of Knowledge.
 12. The Spreading of Knowledge.
 13. Rapid Communication.
 14. Enhancing the Senses.
 15. The Teacher. .
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CHAPTER XI

THE REPOSITORIES OF KNOWLEDGE

ALL over the world men praise the glory of Literature, some for its exquisite art, most perfect in poetry, others for its service to man as a most marvellous instrument for the preservation and diffusion of knowledge and experience. In it we preserve as far as possible the thoughts of our ancestors—that is, the mental and moral discoveries that they have made. Long before the invention of writing this use of language was fully appreciated, and in every land there were men whose business it was to memorise and teach the songs and chants which recorded the religious thoughts and aspirations of their ancestors, as well as the stories of their exploits and modes of life. Such in India were the materials out of which Vālmīki wrote the Rāmāyana, and from which Vedavyāsa compiled the Vedas and the Mahābhārata which, like many of the Purānas, are largely translated into living vernaculars and recited in every household. Every nation has its ancient treasures of literature and tradition, veritable mines of wealth for those who can separate the gold and jewels from the

mass of ore, as the traditional swan is said to separate the milk from the water

Just as our ancestors have worked at the matter of the earth and prepared it for our use, and as they have built roads, bridges, canals, and charted the land and the sea with maps, and have invented tools and engines, all of which enrich our lives to-day, so they have worked also in the fields of knowledge and handed on to us their best thoughts about life, their ideas about right and wrong, justice, truth, love, energy—hundreds of impalpable facts of knowledge which make our mental and moral lives rich and beautiful and enable us to live together without fighting all the time. These ideas embody so many mental, moral and spiritual discoveries, and the rules of life formed from them are inventions, engines of social progress, to some extent perfected but still to be altered and improved by further discovery and invention. Therefore in modern life we cherish literature not only for its record of the past but also as the repository of facts of experience which are the lanterns that light us to true knowledge and from that to right action. Facts of all kinds have been collected and arranged into groups for convenience and reference, as materials for building all the sciences on the stable foundation of a careful observation unmixed with fancy and prejudice.

Literature is a compound of two things, language and writing. Both of these are tools in man's hands,

but they still require improvement, like most other inventions. Language with its enormously rich store of words, is still imperfect and must be improved by deliberate invention. To illustrate its defects we may take an example from English—there is no pronoun for ‘him or her’, and this causes many awkward expressions, thus: “If anyone desires a reward, let him or her claim it.” Even our venerable Sanskrit, worked upon and perfected as its name implies, does not distinguish for us between ‘a man’ and ‘the man’. Another defect is inflexibility, which causes languages to die. Sanskrit and ancient Greek, for example, both full of inestimable treasures, have become inaccessible to the average man, because of their rigid perfection. Language is a living thing, constantly changing and growing, and for it, as for every living thing, rigidity means death. The treasures of dead languages are not, however, lost to us, for there are always scholars who search them out and translate them into living tongues; but it is out of the question for busy modern men to learn dead languages with sufficient thoroughness to derive very much benefit from them. As soon would one think of swimming across a river when one could walk over by a bridge, as of reading in the dead languages truths which have been translated into the living tongues—as a philosopher once said.

A third defect of language is its want of universality. Until recently the people of the

British Isles spoke three or four distinct languages, and the English, Welsh and Irish could not understand one another, but English was made compulsory in the Elementary schools, so every one now speaks, reads and writes in English. In India our great patriot M. K. Gandhi is working for the spread of flexible Hindi, including words beloved by Muhammadans as well as those derived from Sanskrit, just as English contains words from Latin, Anglo-Saxon and other sources, including twenty or thirty from Indian languages. Thus one can speak of 'kingly' or 'royal' (Anglo-Saxon or Old French), or of 'land' and 'territory' (Anglo-Saxon and Latin), and English is richer for the variety of expression. The claims of Hindi to be the national language of India are that it is already understood by the vast majority, is easy to learn, suits the modes of thought of Indians, and is well adapted for commerce, law, politics, philosophy and science, as well as for religion.

We do not know when writing was invented, or by whom. Man of the Stone Age was unacquainted with it, but he had already begun to draw excellent pictures of animals on horn, bone and rock. Every student is acquainted with the picture-writing of the ancient Egyptians and other peoples. Inscribed pottery has been found in the buried ruins of ancient Troy, and every civilised people have left some trace of a mode of writing. The latest form of writing is

by means of alphabets more or less phonetic, which are used by Aryan nations throughout the world. In India there are many scripts in common use, of which Nāgarī and Urdu have the best claims to become the universal script of India. Such a script there must be sooner or later, for the whole purpose of writing is to communicate and unite. It is strange that in this most important matter men resist inventions and cling to alphabets invented hundreds and perhaps thousands of years ago, notwithstanding their manifestly serious defects. The existing signs of all alphabets are over elaborate, bad for the eyes, painfully slow and laborious for the hand. To cling to them is worse than to reject railways, motor-cars, telegraphs and printing machines, and to insist that humanity shall travel only by bullock carts, send messages only by runners and write books only by hand. They are also defective phonetically, so that the spoken sound is not always clearly represented by the written sign, especially in the Roman script (English) which entails the tremendous task of learning to spell thousands of words. The future requires some form of phonetic shorthand, with simple geometrical signs—beautiful, convenient, economical and swift, fulfilling the ideals of all modern inventions. Here is a very clear case where, while we acknowledge the enormous debt which we owe to the past, we realise that the payment of that debt is to be made to the future by perfecting the

instrument of writing for the convenience of generations to come

How much reading and writing were valued in ancient India may be judged from the statement of the Rāmāyana that in the time of Dasharatha, the father of Shri Rāma, every person could read and write. We acknowledge their value now in the efforts that are put forth to make reading and writing universal; in the books, newspapers and magazines that circulate by the million; in the libraries that we set up in all our towns. And we acknowledge that among all the losses of war there is none worse than the destruction of libraries of valuable and ancient books, as their preservation is one of the greatest blessings of peace.

CHAPTER XII

THE SPREADING OF KNOWLEDGE

It has often been said that man does not appear to have advanced mentally since the times of our great religious and epic compositions and other works which, though ancient, rank among the highest human productions. It is pointed out with unquestionable truth that the greatest and most perfect thoughts and teachings are embodied in ancient sacred and philosophical works, such as the Vedas and Upanishads and the philosophies of India, China, Greece and Rome. It is evident that there have always been remarkable sages and saints, either as avatâras from more spiritual worlds and inspired men of our own world, or as men who were in the very forefront of our long human procession that is slowly treading its way to superhuman perfection; yet it must be emphatically said that the great masses of humanity have made enormous mental progress within the last two thousand years. While outwardly recent times have formed an era of mechanical progress, inwardly the era has been one of mental growth, and now with the close of the great European

war we approach a new era of moral growth, in which men will seek not merely to invent machines to be used indiscriminately for production and destruction alike, but will invent means of using them for the benefit and happiness of all mankind.

Nothing has done more to assist this widespread mental development than the inventions of paper and printing, by means of which a wonderful variety of knowledge about things and men is spread among the hundreds of millions of civilised people. In old days knowledge was recorded rather than spread; now it is recorded *and* spread, and circulated rapidly, as will be seen in our next chapter. Before the days of paper men scratched their words on clay or waxen tablets, sheets of metal, such as copper, lead, bronze and brass, and on palm and other leaves and beaten bark, and wrote on prepared skins. Even after paper was invented books were for long written slowly by hand, and were very scarce and difficult to obtain. Even so late as seven hundred years ago in England we find Roger Bacon, the most earnest European scholar and teacher of his time, complaining that copies of valuable works could not be had, though he had made diligent search for them throughout Europe for twenty years and more. How different is the case now, when the printing press turns out books by the million and every artizan can have in his own private library the literary treasures of the world!

Paper first appears in Egypt, made from the papyrus reeds of the Nile swamps. The Chinese also invented it over two thousand years ago, and their raw materials were cotton and vegetable fibres. The Japanese quickly followed suit, and in the course of time the manufacture of paper spread throughout the world. Yet it is only five hundred years since the first paper factory was opened in England. Now paper is made in large mills in enormous quantities from pulp of wood and various grasses, surat bark, linen, cotton, and silk rags, jute waste, rice straw and other materials. All these materials are available in India, yet there are only nine or ten paper mills in the whole country. The Japanese, however, have carried paper making to great perfection, and have learned also to waterproof their paper which is made from the fibre of the mulberry tree, so that it can be used for cement bags, inner tubes of bicycle tires, material for packing and binding books and many other purposes.

Though paper and printing are the outstanding inventions for spreading knowledge through books, newspapers and magazines, we must not forget our debt to the hundreds of inventors of writing tools and materials, such as pens (the stylus for scratching, metal and quill pens for applying ink, and fountain pens which contain the inkwell within themselves) pencils of all kinds (including small brushes used by painters), and inks and colours applied with water,

grease and oil. Of writing machines we have two—the electric pen and the typewriter. The former is intended for engraving on metals, and has a sharp needle which vibrates very rapidly and digs a little trench in your gold or silver watch as the writer guides the point to trace your name upon it. The latter was invented just over fifty years ago and saves much trouble and time involved in our clumsy system of writing, for the operator has simply to press down the letterkeys which lift the type-bars and cause the type to kick against the paper or against the ink-ribbon which is in front of it, and thus leave a clear and beautiful print.

Printing is the art of producing by machinery a number of impressions from engraved metal plates, smooth stone surfaces bearing writings or drawings in lithographic ink, and carved or cast reliefs such as wood, rubber and metal types. Practical printing by means of movable types was invented five hundred years ago by Laurens Coster of Haarlem in Holland and Johan Guterberg of Mainz in Germany. Fifty years later William Caxton, who had seen and used the new printing press on the Continent, brought the invention to England and started to print books in London. For a long time presses were made of wood and worked by hand, but in 1801 an Englishman invented the first iron press, and in 1814 “The Times” newspaper began to use a steam press. Still the press could print only about 1,000 sheets an hour,

but further improvements were made from time to time, until in 1858 the Hoe machine was invented, which could print 20,000 impressions in an hour. Later still came the Walter press which printed from curved plates not upon sheets but great rolls of paper, which are fed into one end of the machine and come out with great rapidity at the other as finished newspapers, printed, cut, folded, counted and laid out in neat stacks. The printing art is not confined to the reproduction of letters, but can multiply plain and coloured pictures indefinitely from blocks of copper or zinc, engraved by hand or etched by photographic process.

Photography or 'light writing' is one of the most wonderful modern inventions. It depends upon the fact that light can affect certain chemicals, and when glass plates or films coated with these chemicals are placed in a camera, the light that is allowed to enter affects them and reproduces the scene that is in view. What is called a negative is thus formed and when this is chemically fixed so that light will no longer affect it, it can be exposed to light with chemically sensitive paper behind it, and thus the picture can be printed by light any number of times.

To reproduce photographs and pictures painted on glass greatly enlarged so that many persons may view them at once, we have the magic lantern. In this case a strong light thrown through the plate (or slide as it is called, because it slides into position

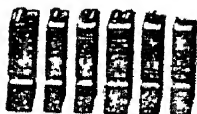
between the light and the lenses that guide the light) carries the picture to a white screen, on which it appears. The fullest development of this invention is the cinematograph, which is doing marvellous educative and informative work throughout the world, for its interesting moving pictures attract hundreds of thousands of persons nightly in the big towns of all civilised countries, and teach them much of current events, of animal, bird and marine life, of foreign lands, of scientific discoveries, of the dress, manners and customs of people of different classes; and in the dramas that it presents it more than rivals the stage for its teaching to the masses of courage, honour, common-sense and other sturdy moral qualities. The instrument is an improved magic lantern in which pictures succeed each other rapidly at the rate of about twenty a second, which gives to the eye a sense of continuous motion. It is pleasing to note that the manufacture of cinematograph films has been undertaken with perfect success by Indian companies and it is noticeable that when these films are shown enormous crowds throng the theatres. We owe the first forms of this priceless invention to Edison—the greatest inventor that the world has ever known.

To the same inventor we owe the first talking machine, the phonograph. The principle of this and of later forms of phonographs and gramophones is that the sound vibrates a little membrane or drum to

which is attached a needle which in turn scratches a spiral line on a waxen cylinder or plate which steadily turns and moves. Conversely, when the cylinder is rotated it moves the needle which vibrates the little drum and thus reproduces the sound, which in some instruments is increased by means of a trumpet so that large audiences can listen to the words or music that the machine reproduces. Such is the delicacy of this instrument that Edison says that one square inch of wax can contain as many words as there are in ten pages of this book.



A GRAMOPHONE



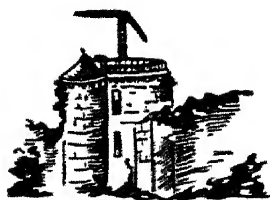
PRINTING TYPE

CHAPTER XIII

RAPID COMMUNICATION

IN old days when people had not yet learned that might is not right, it was the habit of every powerful tribe to increase its wealth whenever possible at the expense of those weaker than itself, so that each small nation was always on the look out for approaching enemies, and quick to signal to all its men scattered over the country the summons to foregather to meet the invading foe. In such times those people were limited to the necessity of beacon fires for spreading their messages over the country-side from hill to hill; and we read in the history of England, for example, how these fire-signals flared throughout England at the approach of the Spanish Armada, and how the Bruce, who became King Robert of Scotland, was invited to the mainland by a beacon just before he defeated the English at Bannockburn. Early records show that the method was practically universal in ancient times; Homer, the great Greek epic poet, mentions, for example, that King Agamemnon signalled the fall of Troy by means of beacon fires.

Later we find, in the time of Napoleon the great, a system of semaphore signals between France and Spain and other countries. Along the main roads semaphore houses were built within sight of each other



several miles apart, and the work of the operator was to watch the signals of his right and left hand neighbours and pass them along the line, by means of his semaphore, which was something like the signal used on railways at the present time—a tall post with arms near the top which he could pull up and down by means of ropes. By means of messages passed swiftly from station to station news could be brought quickly to Paris from all parts of the country. Now we have signalling by the sun's light flashed from mirrors in what is called the heliograph, and signalling with the searchlight by night; and not unlike the semaphore is the system of signalling with flags held in the hands, and the rows of flag signals which are run up to the masts of ships. But latest and most important of all inventions for communication at a distance are the electric telephone and telegraph with wires supported on poles, or cables buried in the earth or sunk in the sea, and the wireless telegraph, all of which we owe to the genius and patient investigation of modern men of science.

These inventions form one of the most powerful weapons that we possess against popular ignorance.

which leads to every kind of folly and sin. By means of them men know what men of other nations are doing and thinking in their own lands, and they are learning the lesson of human solidarity, that is, that all men are members of one human family, having similar feelings, desires and thoughts, and that there is no need for selfishness and jealousy, for our interests lie in common and men and nations all benefit by the experience and achievements of other men and nations. They learn rapidly of the inventions and discoveries which men of other lands are making, which thus quickly become the property of all mankind as men take up this knowledge and use it for their own benefit and for that of family and country; and at the same time they learn to rejoice with pride at the thought that the achievements they themselves make will be speedily reported throughout the world and imitated by others, which is the sincerest form of praise. Thus universal knowledge and experience and progress are swiftly disseminated for the benefit of all mankind, for the advancement of mutual understanding which brings about mutual respect and goodwill. It is the enemy ignorance that makes men quarrel for foolish pride or worldly gain, and these wonderful instruments are playing an important part in spiritual progress by teaching every man that from his brother man all over the world come his greatest blessings of knowledge and experience that can enrich mind and body alike

In many smaller ways also the blessings of quick communication are evident. When those we love have departed on a long journey, for example, we can have news of their safety and of the progress of their undertakings. How strange it sounds to us now, that when the electric telegraph was invented, and was offered to one of the great railway companies of England, one of the inventors was received with ridicule and scorn, and told that his invention could not work, and even if it did it could be of no earthly use to anybody. Now we know it to be essential to the safety of railway travel; every station is fitted up with the apparatus, so that before it allows a train to pass it may ascertain that the line is clear, and also that it may send in advance information that the line is occupied and the train may be expected shortly at the next station

But every one welcomed the wireless telegraph, and its inventor received both wealth and fame—and his labour and genius have indeed borne good fruit, for by this means we can not only signal from Europe to America or Australia in a tenth of a second but out at sea on a stormy night when the waves are beating upon a sinking ship there is refuge at hand. The signals of distress ray out into space, and other ships or perhaps boats from the land speedily arrive to rescue the crew. It happened recently in America that a huge flood swept through a large town and inundated the country for miles

around, breaking all communication by telegraph and telephone wires—then wireless messages went forth from the huge antennæ above the beleagured town, calling assistance for the distressed inhabitants from hundreds of miles around. Indian students will be proud to learn that one of their own countrymen, Sir Jagadish Chandra Bose, discovered a method of transmitting and receiving electric waves through the ether so that he was able to ring a bell and displace a weight at a little distance, in the same year as that in which Signor Marconi (who had an Italian father and an English mother) brought forth the wonderful invention of wireless telegraphy.

The invention that had made possible our modern telegraph is that of the electric battery of which each single part in its simplest form is a glass cup containing rods of copper and zinc dipped in acidified water—it is then found that when the two rods are joined by a wire a current of electricity will run round the circuit. We know that the electricity is there because it has the powers of converting iron into a magnet and of moving magnets, and we can make it move needles and bars of iron so that we can see and hear motion. A number of these simple cells, as they are called, forming a battery can send a current of electricity along the telegraph wires from one big town to another, and even from Europe to America along cables laid in the ocean. For sending electric waves through the air in

wireless telegraphy we need a far more powerful generator of electricity. The telegraph records its messages by means of clicks of a needle or bar of iron and by printing dots and dashes or other signs on a strip of moving paper, but it can also print actual words, send your signature or other writing, and even transmit pictures and photographs—though for these purposes much more costly apparatus is required.

The telephone is the instrument by which you can hear a person speak at a great distance, as from London to Paris. In America there are telephones by which you can speak to your friend a thousand miles away. In these instruments, when you speak the air shaken by your voice moves a little drum which by moving affects an electric current in the circuit wire, and when that current arrives at the other end it shakes another little drum so as to reproduce the sound of your voice. All these instruments, in their many forms and complex detail, are the outcome of the patient work of hundreds of scientific men who for the last century have worked with untiring perseverance at electrical experiments.

CHAPTER XIV

ENHANCING THE SENSES

MAN in his thirst for improvement has not remained content with the senses with which he is at present normally endowed. He has fully realised that they bring him knowledge of but a little part of the world that is about him. He cannot see things that are too small, or too big; for example, the details of a fly's eye or the form of the continent of Asia, nor those that are too distant; nor those which do not belong to the sense of sight, such as electric waves, sound, heat, thoughts and feelings. He cannot feel the weight of things that are too light or too heavy. And there is undoubtedly an enormous variety of things which he cannot realise by any of his senses. So, in order to increase his knowledge, he has striven to enlarge his powers of sense either by the invention of outer instruments or by the development by yoga exercises of powers that are still latent in the human body. Undoubtedly the former, as far as they go are of more general use and easier of achievement, but the latter have far wider scope as may be seen by any one who cares to dip into the third book of Patanjali's "Yoga Sutras".

Inventions for increasing the powers of the sense organs are very numerous, and it is significant that they are nearly all connected with the sense of sight. It is impossible to describe them all, but we will mention here fifteen of the principal inventions for gaining knowledge through the sense of sight.

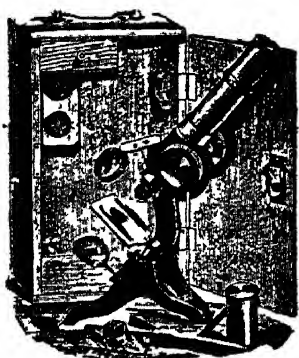
1. The telescope, for seeing things clearly at a great distance, is said to have been understood in principle by Roger Bacon, but it was not applied until about three hundred years after his time when, the story goes, the children of a spectacle maker, Jansen, were playing with two magnifying glasses and got them in such a position that a church tower that they were looking at seemed to come nearer to them. They showed this to their father, who at once made some toy telescopes. This became known to the great Italian astronomer Galileo (who was threatened with death by the priests of his time for declaring that the earth went round the sun) and he constructed the first useful telescope, and discovered with it the mountains on the moon and many other things. Since then many forms of telescopes have been made, small and portable or large and fixed, some of which magnify the object hundreds of times. The largest is that newly set up at Mount Wilson in America,



A TELESCOPE

which can show 300,000,000 stars, a stupendous revelation when we realise that each of these is a distant sun with its own planets like our earth whirling round it.

2 The microscope, like the telescope, is an arrangement of curved glasses called lenses, which can magnify an almost invisible speck until you see that it is a dreadful looking monster with horns, eyes and legs, beside which a lion or a tiger is a very harmless-looking creature, and



A MICROSCOPE

brings into visibility a world of tiny living creatures that cannot be seen by the naked eye, magnifying even to the extent of one hundred million times. It was invented by Jansen about three hundred and thirty years ago, and improved from time to time by Galileo and others. An attachment for measuring minute objects was very soon invented, and sixty years ago Whitworth made one to measure small objects to the millionth of an inch.

3. The use of spectacles to correct defective vision is very common in our days, for many people have become careless of their eyes and have fallen into the habit of reading too much, often from bad type and by bad light. This is a striking instance of the abuse of a valuable discovery, when people are reckless of their eyes because they know that

spectacles can be had when their sight begins to fail. They are made of glass or rock-crystal. It is uncertain to whom we owe this valuable invention, but it is probably either Roger Bacon or a contemporary, Alexander de Spina.

4. Electric photography or radiography gives us pictures of hidden objects of different densities, for the X-Rays, discovered by Rontgen in 1895, pass through many things that obstruct light, such as wood or flesh, though strangely enough rock-crystal is opaque to them. It is very useful in surgery, as, for example, to find a bullet lodged anywhere in the flesh. Once a baby swallowed a coin which stuck, but the surgeon was able to find its exact position with the aid of X-Rays so that he could readily remove it. The rays also distinguish a genuine diamond from a false one. An improvement on the invention, the fluoroscope, enables one to see the shadow pictures direct on a screen, where appears, for example, the black shadow of bones surrounded by the grey one of



FLUOROSCOPE VIEW

the flesh. At certain frontier stations the baggage of travellers is examined by this method, so that it may be seen whether any dense objects such as revolvers are within, without the time and trouble usually spent in opening the bags and boxes.

5. Another class of rays called N-Rays and physiological rays was discovered by Blondlot in

1903 They increase the luminosity of sparks, flames and lighted surfaces, and make vision more acute. By their means one can detect in a dark room rays which are sent out by a brain engaged in thought, and the harder the brain works the stronger is the visual effect of the rays on the luminous screen held at a little distance. The rays come also from nerves and muscles, but when a limb has been put to sleep by mesmerism no rays come from it, nor from a dead body.

6. One of the most wonderful inventions for bringing the unseen world within view is the chemical screen recently invented by Dr. Kilner. Looking through this one can see the aura of a person (or rather a portion of it) as a fine shadowy film surrounding the body; and in this aura can be seen the signs of particular diseases and the effects of thoughts and feelings. Unfortunately prejudice has prevented this invention from being fully appreciated and used, but no doubt the future will bring it justice.

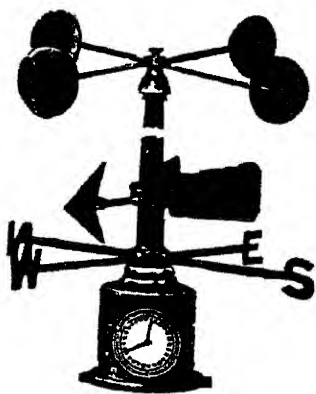
7. The compass needle, galvanometer and electroscopes are used to indicate the presence and nature of magnetic and electrical forces, and the first of them is of special use for guiding the courses of ships.

8 Weighing machines bring within the reach of sight the weight of objects both large and small. The chemical balance, with its delicate adjustment,

has been of inestimable value in chemical researches and industries that depend on them.

9. Sounds are brought to view by means of the microscopical examination of the trench of the phonographic record, and also by an observation of flames which are caused to flicker differently by different sounds. The flickering flame can be seen as a varied band of light when it is viewed by means of revolving mirrors.

10—15. For studying the heat of bodies we have various forms of thermometers, in most of which mercury expands along a tube fitted with a scale. For judging pressure of gases we have the barometer, which tells us of atmospheric pressure, and the various manometers which indicate the pressure inside the boilers of steam engines, making for the safety of those who have to work near them. To know the direction and speed of wind we have the weathercock and the anemometer, a set of little cups which revolve and turn recording wheels. The hygrometer tells us the humidity of the air—a matter of importance for health and for successful work in spinning, weaving and some other industries. For judging levels and perpendiculars in building work we have the plumb-line and the spirit level, without which correctness of building



AN ANEMOMETER

could not be assured and accidents from falling walls might often occur.

For the use of the ear three instruments may be mentioned ; the microphone, a kind of magnifying telephone, by means of which the sound of a walking fly may be heard as loud as that of a galloping horse ; the stethoscope by means of which the doctor listens to sounds within the body, such as those of the heart's action ; and the megaphone, a conical tube often used at sea, for increasing and propelling the sound of the voice.

The latent powers of man are receiving more and more attention, and much successful research work has lately been done in connection with the transference of thought from brain to brain at a distance or from mind to mind, without external instruments or signs. The objectivity of thought has thus been demonstrated to many thousands of investigators, and the means of training the mind to become sensitive for the purpose are becoming more widely recognised and understood. What is called clairvoyance, the ability to see thought-forms, auras and hidden or distant objects, is also growing more frequent ; and many thousands of people (including some of the most eminent scientists, such as Lodge, Crookes, Wallace and Lombroso) have gone still further and declare that communication with the so-called dead is not only possible, but is being regularly carried on with increasing success and reliability.

CHAPTER XV

THE TEACHER

It will have been seen by those who have read the previous chapters of this work that we owe to the past not only the material necessities and conveniences of life, but also knowledge with which we can work, and the development of thought, affection, devotion, will and, in general, character. Our mental life would not be full and rich were it not for the fact that the best thoughts of the past have been carefully collected and preserved in religious and other books as rich mental food and material for our thought at the present time. Out of all this material a selection is made of those things which are likely to be most useful in the future life of the student, and these are taught to him by parents and teachers. How great is the gain from teaching may be seen by considering that a student can learn from his teacher in a few weeks or months things which the cleverest men in the world took hundreds of years to discover and understand. For example, he can teach him in one lesson how to set up an electric bell, how to make a first-class road, how to do a difficult sum,

or what are the properties of gravitation or oxygen—things which he could never have found out by himself, and which were discovered in a long time with the greatest difficulty by the cleverest men. The teacher is thus one of the strongest connecting links between the past and the future, and this usefulness shows us the great power that we have to help one another and the miserable poverty of our lives where there is no such help.

The teacher, however, does something more than transmit to the student that selected knowledge which is likely to be of use to him in his future life. He helps him to unfold and develop his powers. He calls out his power of devotion by means of stories of the divine incarnations and of the lives of saints and sages, and by reminding him constantly that he and all men are but servants of the one God, obedient or disobedient, clever or stupid, selfish or unselfish as the case may be. Thus the student learns that he must work for ideals, and that what he possesses does not really belong to him but to humanity, to be held and used by him for the greatest good. At the point of death the wise man realises : “What I saved I lost, what I spent I had, and what I gave I have.” And as eagerness for knowledge appears and grows in the students the teacher strives to attract it to those things which are useful, beautiful and true. He also encourages work, knowing the joy of it, and understanding that the student will

learn the power of his own will by doing definite and successful work. How clear, then, is the duty of the student, who is preparing to be a useful citizen, to try to please the teacher who cares only for his healthy progress.

Where the teacher is not present, as when we get older, we can make a shift with books, but the wise man will never dispense with a teacher or teachers, and will always seek the company of the good and the wise, so that he may listen thoughtfully to their words. But there is always something useful to learn in every environment and in all sorts of company, for the old saying is profoundly true that a wise man can learn even from a fool, though a fool cannot learn even from a wise man.

In addition to the teacher there are two other special agencies from which we obtain the benefits of past progress. These are the home influences and the social manners of our time and country. How great the home influences are over the mind of the young can be judged from the example of the mother-tongue and the home religion. Every student knows how much more vivid in his imagination are stories which he reads in his own vernacular than those in any foreign tongues which he is learning. It is only after many years residence in a foreign country that the influence of the mother-tongue declines and one is able to use a foreign language with the same ease.

The manners of our times reflect the average current opinion of what is best in conduct, and they represent much accumulated social experience, of which each nation has made its own selection. Life is constantly changing, and each generation with its added experience and new desires and conditions makes a somewhat different selection. Just as it is impossible for one person to discover truths of science, philosophy, religion and art for himself, and thus to create a culture of his own, so is it impossible for one to invent a new set of social rules. We accept the world that has been prepared for us by our ancestors, adopting their speech, dress, manners, habits and customs, only setting these aside when they distinctly offend our judgment or our sense of what is right and wrong, or when we have a decided impulse towards a particular change. Manners are social machinery, invented for the sake of smoothness in social life, and the gentleman adopts those that are generally understood, and uses them without awkwardness because he understands that "Manners are not idle, but the fruit of loyal and of noble mind." But as with other machinery, there are constant improvements and inventions, so that in England, for example, there has been enormous advancement since the days when people used to feast and drink heavily and enjoy coarse and hurtful jests. Nowadays a gentleman means a man who is master of himself and at home in his environment, where his first care is

to avoid wounding the feelings of others. Current manners still involve a great deal of insincerity, hypocrisy and untruthfulness, and no doubt immediate changes will bring into them more honesty and straightforwardness than are common at present.

In larger groups we can see clearly that each nation has developed along particular lines and brought forth characteristics valuable to humanity as a whole. Just as some men are musicians, others scientists, others engineers, others merchants, and so on, but no man can excel in all these, though all are necessary for human society, so has each nation some special character in which it excels and is of use to all the others. In the British nation, for example, the Scotch have become noted for colonisation and engineering, the Welsh for music, the Irish for humour and imagination (that goes too far to be practical), the English for science and merchantry; so among the Aryans we have the Indians for philosophy and religion, the British for material progress and sturdy achievement, the Germans for industry, the French for wit and enthusiasm, the Italians for art, the Spaniards for personal grace and so on. Each one who is born into a nation comes to inherit the treasures that his ancestors have stored and to develop in his own character something of the qualities for which it stands. It will thus be seen that the nations provide a full training ground for human

souls, and that while each has developed its particular character this involves no necessary antagonism between them, for the good of each is of benefit to all the others, since humanity is one.



THERMOMETERS



A BAROMETER

PART III

BENEFACTORS OF HUMANITY

16. Statesmen, Warriors and Legislators.
 17. Religious Teachers, Doctors and Philosophers.
 18. Inventors, Engineers and Scientists.
 19. Explorers, Producers and Merchants.
 20. Musicians, Sculptors and Poets.
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CHAPTER XVI

STATESMEN, WARRIORS AND LEGISLATORS

IF we enjoy the blessings of liberty to-day, it is because there have been brave and wise men who have fought with tongue and pen and sword against selfishness and greed, in order that men might be free from slavery, and permitted to live on the land and cultivate it, to carry on manufactures and trades, to travel about, to follow their chosen religion, and to enjoy the fruits of their labour without molestation and deprivation.

Those great men who have won these blessings for us (so far as we enjoy them) were statesmen, warriors and legislators. Their watchword has always been 'towards freedom', and the qualities of character which inspired them in their noble, dangerous and responsible work were the three qualities of all truly great men: benevolence, courage and understanding. Great men aim at doing good, and for this they will face the greatest dangers and spare themselves no trouble to understand what is good and how to bring it about.

Again and again such men have left some progress in freedom as the mark of their lives upon the world. Thus Akbar fought for a united India in which all religions should live peacefully together, children should not be bound in marriage, animals should not be sacrificed, and confessions should not be forced by torture. Sivaji fought for the liberty of Hindus against a superstitious king who oppressed them with special taxation, destroyed their temples and hindered their pilgrimages, and after him Tārā Bāī, a widow of one of his sons, carried on the same work with deadly energy. Asoka used his regal power to ensure kindness to animals and men, and to spread throughout Asia and parts of Europe a knowledge of the priceless religious teaching of the Lord Buddha. No clearer example of bravery could be sought than the story of Chand Bibī of Ahmednagar, which tells how the great Moghul army was advancing to a breach which it had blown in the city walls and the Ahmednagar captains began to run away, when Chand Bibī swiftly put on armour and her veil, grasped a sword and rushed to defend the breach, so that her soldiers were inspired with new courage, the admiring Moghuls were forced to retire, and the independence of the country was saved. Not less courage, though of a different kind, must have been required by the famous Persian lady, Nur Jehan, who governed the great Moghul empire for her lazy husband, Jehangir; or by Ahalyā Bāī who for nearly thirty years

governed the Holkar's dominions with great justice and wisdom.

To all such great characters we owe a twofold debt—for the lasting good that they have done for mankind, and for the example of high qualities that they unconsciously set, which inspires posterity with noble ambitions and instructs them in virtue. From them we learn the true work of Statesmen, Warriors and Legislators—to promote human unity, to establish firm peace on a basis of individual happiness and prosperity, and to organise humanity for peaceful social life and industry.

The history of the world can present no greater example of these three functions invested in one man than that of the great emperor Akbar, who sought to unite the Hindu and Muhammadan people by abolishing the special taxes on Hindus, appointing Hindus or Muhammadans indiscriminately to the highest posts in his empire, and arranging inter-marriages among the nobles. Thus people of different religions lived on equal terms, both Hindu and Muhammadan officials and soldiers served him well, and his wife, the mother of his son Jehangir who succeeded him on the throne, was a Hindu princess. He abolished the old practice of humiliating and enslaving conquered enemies, and on the contrary won their allegiance by raising those that were worthy to high and responsible positions. By his wise laws he also put a stop to many evils, and the

great empire that he built in India, ruled by his descendants who were of both Hindu and Muhamadan stock, would have continued to flourish on the strong basis of public happiness and prosperity but for the foolishness of his grandson Aurungzeb, who revived the taxes on Hindus and pulled down their temples, and allowed the poor to be annoyed and oppressed by officials, so that before long rebellions arose in every direction and stern rule replaced Akbar's wisdom. Akbar was also a great warrior and often led his own army in those conquests by which he hoped to unite the greater part of the unsettled peoples of India under one peaceful rule. His energy, rapidity and decision were remarkable, as for example on the occasion of the rebellion in Gujerat, when he surprised his enemies by his sudden appearance, for he set out on a swift dromedary and travelled the eight hundred miles of distance in eleven days.

The history of every country that has progressed contains many examples of great reformers. In England one of the most honoured names is that of William Wilberforce, who worked steadily for over forty years for the abolition of slavery in the British Colonies. He first began his agitation about 1790 in face of the fierce opposition of wealthy slave owners and traders, and after seventeen years of perseverance it was made law that no more slaves should be brought from Africa to the British Colonies. After twenty-six more years of persistent work, total abolition of

slavery was at last declared, only three days before the death of Wilberforce, who had given his whole life to the work. In America an agitation was set on foot by several brave men, and nearly thirty years after the British Parliament had abolished slavery, the brave President, Abraham Lincoln, made his famous anti-slavery pronouncement, which led to a great civil war, for the planters in the Southern States would not give up their vicious traffic in human lives and liberty. Fortunately the Northern States won and slavery was abolished. It was a magnificent thing for those white men of the north to lay down their lives in war solely for the liberation of the Negro slaves, and he was indeed inspired whose eloquence stirred them to such noble sacrifice.

Six hundred years ago an insolent Austrian Governor in Switzerland set up a ducal cap in a public place and required all the Swiss citizens to salute it when they passed. The great patriot Guillaume Tell refused to do this, and was arrested and suffered much on account of his independence. The incident led on to the formation of a Swiss League and a struggle by the mountaineers for release from the Austrian yoke. The victory which finally freed the small nation is said to have been due to the patriot Arnold von Winkelried, who broke the Austrian line by rushing forward and grasping in his arms a number of enemy spears, so that his comrades were able to pass to triumph over his

body through the gap that he had made. Thus do oppression and widespread evil always fall sooner or later before the inspired courage of heroes. One interesting case of this is the story of the monk Telemachus, who brought to an end the horrible gladiatorial shows in Christian Rome, in which men, and sometimes women, used to fight for pay or for a disgusting kind of fame before thousands of amused and excited spectators. This monk, in his violent protest, threw himself amongst the fighters and, though he was cut to pieces by their swords, he made people realise the horror of their so-called sports, so that they were brought to an end.

One of the greatest statesmen of our time is President Wilson of the United States who, at the close of the great war, amid the bitterest remembrances of wrong and wickednesses, dared to assert with uncompromising voice that has arrested the attention and impressed the imagination of the world, that the new world peace must be built upon the amity and independence of all nations, small and great, without hatred, revenge or greed.

One benefactor remembered with much reverence in England was the Earl of Shaftesbury, whose nobility was shown in the words which he spoke when approaching death after a life-long service of the poor. "I cannot bear to leave the world, with all the misery in it."

Yet it is not only to the great Statesmen, Warriors and Legislators that mankind owes a great debt, but

to men of all grades under them who have honestly assisted them—civil servants, police, judges and lawyers in all grades and ranks, and the independent social reformers in whom well up from spiritual depths of character principles of freedom, truth, justice, honour and kindness which are the fertilising waters of human life.

The ideal knight is strong, brave, truthful, tender, courteous, self-controlled. He never raises his hand against one weaker than himself, nor takes unfair advantage of another, nor speaks ill of the absent, nor is unfaithful to a friend. Honour is his watchword, and gentleness his ornament. He is helpful and considerate, especially to the weak, is fearless in danger, compassionate in triumph, forgiving when wronged, kind to the child and animal.

JOSE

ANNIE BESANT



CHAPTER XVII

RELIGIOUS TEACHERS, DOCTORS AND PHILOSOPHERS

IN the work of ministration to the health of mankind we see that there are three things to be considered. The first is spiritual, which is the health of the soul, and this shows itself in a noble purpose in life, high principles of honour and kindness, worship of God and reverence for all that is great, and a keen sense of right and wrong. Where these are not present, it is not well with the soul. The second is health of the body, which is the instrument for the soul to play upon, just as a musician may play upon a vīṇā, and the quality of the music depends upon the instrument as well as the skill of the player. The third is the thinking mind, which helps the soul to understand and carry out the purposes of its life, and in healthy working must be calm and collected, free from excitement and agitation, which always render thinking inaccurate.

In each of these departments history points to great men who have worked with sublime love, courage and understanding to promote the health of

mankind. Great religious teachers have appeared from time to time in every part of the world, and with their own inspiration have stirred the hearts of thousands and even millions, just as with one lighted lamp hundreds of lamps may be lit. With their greater knowledge they have taught us the purpose of life, to do right for the sake of purity of soul, for the benefit of man, and because it is the will of God. They have taught us about immortality, and that in the future each man will reap the results of his former sowing, so that wrong will always lead to sorrow and right to happiness and progress. Without them we should be wandering in the dark, and discovering the true purpose of life slowly and painfully with our own feeble light.

From the earliest times there have been men who studied the body and learned about its mechanism, its health and disease, what kinds of food and air are good for it, what it needs of exercise and rest, and what remedies must be turned to when it is out of health. Such men are now classed under the general name of Doctors. Thirdly there are the Philosophers who have taught serenity as the law of mind, and that only by serenity of mind can man bring himself into a healthy relation with the world about him, whether in religious or material life.

If one wants to admire a man of marvellous love and courage let him turn to Muhammed, the Prophet

of Arabia, who was noted above all men of his time for his gentleness, trustworthiness and steadfastness, well-fitted indeed to be the prophet of Islām, and the teacher of the religion of peace—peace between man and God, between man and man, and within the individual soul. Such a man was he, born in the midst of horrors of selfishness, hatred and bloody rites which his spirit abhorred, struggling for inspiration in his youth, until at last all became clear, the Angel appeared and taught him and he went forth on his mission of Islām. In the early days of his teaching he was faced with difficulties which would daunt any heart. His followers were persecuted and murdered with cruel tortures, so that at the end of several years only one was left with him in Mecca, and the two (or three, as Muhammed said, for God was with them) escaped and fled to Medina, where he was welcomed and joined by many and he became the ruler of the State. Even there his enemies followed him, but were driven back, and year followed year of struggle, difficulty and enmity, yet full of teaching and example from this man who never lost his gentleness and never broke his word, until at last he died, leaving behind him a divine religion which brings millions of men into allegiance to the one God of all the worlds Who has brought men to a knowledge of Himself in all times by means of divine revelation, which instructs them in knowledge of the immortal state, of perpetual progress in the invisible

worlds of angels, and inspires them to courage, duty and charity in this world.

The same benevolence and courage appear in the life of Shri Rāmānujāchārya, the great reviver of the Bhakti aspect of the many-sided Hindu religion. Attempts were several times made on his life, and in the reign of one king, who blinded two of his disciples, he had to escape in disguise from Shrīrangam to Mysore. His work stirred anew the whole of India to devotion and inspired many other teachers of Bhakti, so that the extent of the good that he did can never be known. From him in spiritual descent came Rāmānanda, Kabir (who aimed at the union of all devotees, whether Hindu or Muslim), Vidya-pati and Chaitanya, who extended the revival into the North of India. The story of Jesus or the Christ in Palestine is one of great bravery and suffering ending in a cruel death, all borne for the love of men. In all these lives activity and untiring work find their fullest expression. Thus we find Shri Shankarāchārya, for example, who, in a short life (for he passed from view at the age of thirty-two) travelled throughout the whole of this great country, from Assam in the north-east to Kashmir in the north-west, and from the Himālayas to Cape Comorin, and left an undying impression on the daily lives of the Indian people.

No life is more inspiring than that of the Lord Buddha, who as a young man was moved to great

compassion by the sorrows of all living things. In his heart there was such spiritual insight that he knew that there must be a solution to the problem of human misery, and his sympathy would not allow him to accept with resignation the suffering of the world. So he, the son of a king, left his magnificent home with all its attractions to wander as a sannyāsī and seek enlightenment by study and meditation, until at last he attained illumination near Gayā. Then followed a strenuous life of travel and teaching, and the spread of that doctrine of gentle life and righteousness which is now followed by hundreds of millions of people who revere him above all men.

The story of the Doctor's profession is full of instances of the heroic service of man. In peace the doctor has constantly to attend upon patients suffering from infectious and contagious diseases, and many are the stories of a patient cured and his doctor stricken down afterwards, even to death. In war his danger while attending to the wounded on and near the field of battle is not less than that of the soldier, and he has none of the excitement of fighting to inflame him with a false courage. In all circumstances his head must be clear and his hand firm. Sometimes special heroism appears where experimental work has to be done, as in the case of some young men who allowed themselves to be bitten by certain kinds of mosquitoes in order that it might be known whether they were the cause of a deadly

fever—the result in one case at least was death. Mankind would be very much the poorer without anæsthetics to deaden pain and antiseptics to prevent the spread of disease. We also owe much to those who in the past have gathered knowledge about the body, and have had the courage to put forth their new discoveries to an ungrateful world, for they have often suffered much at the hands of their fellows, as was the case in Europe in 1616, when Harvey announced his idea of the circulation of the blood, for which he was condemned and hooted out of Society, for “no doctor above the age of forty could be persuaded to believe in the impossible suggestions,” as Hume states in his History. Yet it was known long ago, as “Charaka Sūtra”, Chapter 30, says: “From that great centre [the heart] emanate the vessels which carry blood all through the body—an element which nourishes the life of all animals and without which life would be extinct.” We must mention not only the doctors and surgeons who deal with disease and bodily disorder, but also all those who are concerned with the more valuable science and art which studies the laws of food, exercise, rest and healthy surroundings, by means of which the body may be kept in excellent health and all disease thereby averted.

Those noble and brave ladies who act as nurses for the sick and wounded, sacrificing personal pleasures and facing the most serious dangers, set an

almost unequalled example to mankind, and uplift all who admire them, in addition to the good that they do by their work. Florence Nightingale was the first to organise a band of lady nurses for war in Europe, and she did it in the face of great discouragement, opposition and danger. Afterwards, her system was followed all over the world, and about eight lakhs of rupees were presented to her, but she would not keep this for herself, but used it to build a home for nurses. Her name is honoured throughout the world, yet none can estimate the good that she has done to mankind and especially to woman-kind, by her example of sterling character.



CHAPTER XVIII

INVENTORS, ENGINEERS AND SCIENTISTS

IN earlier lessons we have studied much of inventions, and seen how the lives of inventors are brought to success on account of their superior qualities of self-sacrifice, courage and persistent thought and effort. I have reserved one rather long story for this lesson, because it tells of a most beautiful life—that of George Stephenson, the inventor of the rapid railway locomotive, and engineer of many railways.

At the age of ten Stephenson was a poor boy working down in a coal mine in the north of England, with no prospects but that of being a miner all his life, but by the age of sixteen he had shown so much care, attentiveness and intelligence in his work that he was given charge of a stationary steam engine, in which he took great interest. Soon after this he realised that if he wanted to understand much about machines he would have to learn to read and write, so in the evenings after his twelve hours' daily work was done he went to a school-master for tuition. So poor was he then that he had to sell his spare shoes in order to obtain money

with which to buy books. Being an affectionate man, he married young and worked hard to keep his family. As the years went on he spent his Sundays and his rest-hours reading about machines and studying their designs.

At last an opportunity came to him, for a machine had broken down in Scotland and he was sent to repair it. In order to save money for the education of his son he walked to Scotland and when, after mending the machine, he received his pay (equal to about Rs. 350) he walked back again. On his way he found that his father had been seriously injured and blinded by an accident, so he at once spent all his money on buying for him a little house near to his own home. Then his wife died, and he had left only his little son and his father, and to add to his difficulties he was very poor, and any illness or stoppage of work meant extreme misery, for the workers never had enough money to make progress and also to save.

Another opportunity came when a new pump at the mine works went out of order and none of the experts could make it act, but after they had given up the attempt Stephenson tried and succeeded. His wages rose; he bought more books and sent his little son to school, and every evening father and son studied together the lessons of the day. Then came the beginning of his inventions, and greatest of all his invention of the fast railway locomotive. He also

invented the miner's safety lamp at the same time as Davy, and showed his remarkable character by going with it himself down the mine into a tunnel which had been abandoned because it contained dangerous explosive gas. Yet his difficulties were not over, for every possible opposition was put in the way of the progress of railways. Farmers said that the smoke from the engines would poison the air so that no crops would grow, that the cattle would not feed in the fields near the line, and that the sparks would burn the haystacks and houses, and at the same time the proprietors of canals raised every objection because they feared that the success of the railway would reduce their own traffic and profits. The landowners did everything in their power to prevent him from planning out the land for constructing a railway, and some of them set hired spies to watch him and to chase him away by force, so that he had to go at night to make his explorations and sometimes he had gunshots fired some distance off so as to lure the spies away from where he was. Slowly he lived down all these difficulties and built the first railroad in England, and then constructed lines in France, Belgium, Italy, Spain and Egypt.

The great American inventor, Edison, was also a poor boy, who at the age of twelve sold apples, toys and newspapers on one of the American railways. The budding inventor started a little news sheet of his own, which he printed by pressing paper with his

hands on to the inked type, and this venture was quite successful until it came to an abrupt end when he took to chemical experiments and set the train on fire with phosphorus. One day at the risk of his own life he rescued a little boy who had strayed in front of the train, and the child's father, full of gratitude, taught him his business, which was telegraph operating, so that he was able to get an appointment in the telegraph department, where he began to take an interest in electricity, and his inventive genius soon showed itself in the discovery of the means of transmitting more than one message along a single line and in many other ways. He never went to school, but was well taught by his mother and father and himself, and he has been the most prolific of all inventors. This one man has saved the labour of millions and has given us original inventions and fundamental improvements relating to electric light, the telegraph, the telephone, the phonograph, the cinematograph, the dynamo, the electric pen, the megaphone, the tasimeter which measures the heat of stars, and other things. The story of his life is one of unremitting industry and perseverance, at first unspoiled by poverty and hardships, and later unspoiled by the enormous riches which he acquired and largely spent on his laboratory and library, which are an institution which will be valuable to the world long after he has gone, as they constitute in a sense a college for inventive research.

His single discovery of methods of sending several messages over one wire has saved millions of pounds worth of extra telegraph lines, a fact which illustrates the truth that the productiveness of mental energy is infinitely greater than that of physical work.

Complex scientific inventions are quite a modern thing even in Europe, and it may be assumed that India is only a little behind the times in this respect. Progress is already beginning to be made, so no doubt in the course of the next two or three generations we shall find Indian inventors standing in the forefront of success, along with their European and American brethren. It is well known that Sir Jagadish Chandra Bose has invented a number of most marvellous scientific instruments for making delicate measurements, and that Doctor Sir P. C. Ray has invented several important pieces of useful apparatus, such as the sulphuric acid plant. Only recently an Indian doctor has invented a new food-preserving chamber containing nitrogen and carbonic acid gas which will keep food such as fruit, butter and eggs perfectly fresh for six months. As it is perfectly safe it is a great improvement on the older Lawton apparatus which contains carbon monoxide gas, which makes an explosive mixture by which Mr. Lawton and two assistants lost their lives, and it has not the inconvenience of the cold storage apparatus.

The story of Engineering contains many illustrious names well known to the public, such as that of

Telford, the great bridge builder, who in his early days was a working stone mason. Such men are human assets of great worth for their example of courage and the lesson that they, in common with the inventors and scientists, teach us that man can be master of Nature by working with Nature's laws. It is a form of religion to glory in the building of a splendid bridge or a railway over the mountains. Recognition of the definite laws of Nature, which are the laws of God, and the implicit obedience to those laws which marks the inventor, the engineer and the scientist, are really a kind of worship and a definite drawing nearer to God. One of the most thrilling engineering stories is that of Sir John Hawkshaw's completion of the railway tunnel under the estuary of the river Severn from South Wales to Gloucestershire, which is the longest and largest submarine tunnel in the world. After the work had been going on for about seven years the miners suddenly struck water, which poured out in such quantities that they had to run for their lives, and in a few hours the entire working was filled. New water rushed in as fast as it could be pumped out, so three brave divers were sent down to block up the hole where the water poured in. This was only one of a number of floods. On one occasion a pump burst and water coming through fissures in the rocks filled the works, on another the river water poured in through a leak; on still another

there was a tremendous storm, the sea ran up the estuary, overflowed its banks and poured down a shaft into the tunnel, imprisoning a great many men, who were fortunately able to get on a wooden platform near the roof of the tunnel and wait there in the face of death until the inrush of water could be stopped and boats brought to their rescue. The first spring burst through again several times, and one of the divers had to go down the shaft and along the tunnel full of water for a thousand feet to shut off the water. Five and a-half years after the first great inrush of water the difficulties had been overcome, the last of the seventy-seven million bricks had been put in its place with the last of the thirty-seven thousand tons of Portland cement, and the tunnel was ready for use.

The Scientist differs from the Engineer in that he is more concerned with thought than with action, and with the discovery of the laws of Physics or Chemistry or Physiology than with the application of the laws to practical undertakings. Though in his case also an immense amount of courage is shown, as for example in Roger Bacon, sometimes called the father of European science, who in the course of his practical studies lost an eye and a finger and often injured himself in other ways, it generally appears in the form of untiring patience and persistent endeavour. Charles Darwin, the great discoverer of the law of continuity of living forms, is the greatest

example of this quality, for he collected an enormous number of facts and carefully studied them for years before he announced his discovery to the world. For many years he was the man most hated and denounced in Europe, for people wanted to believe that all the various living creatures were suddenly made by God, instead of being slowly produced by evolution in the course of a gradual creation which is still going on.

In the history of Science one particularly interesting story is that of the discovery of radium by Madame Curie of Paris. Her childhood's life in Poland was one of great happiness and she soon showed signs of uncommon intelligence and interest in science, so her father arranged for her studies in Warsaw and afterwards at the Science Academy in Paris. In those student days nothing daunted her in her eager search for knowledge, and so little did she think of poverty and hardships that a visitor might have found her cheerfully carrying her own coal up four flights of stairs to her little room, as in her later days after marriage when she and her husband were devoting their energies and small funds to research work he might have found Pierre sweeping the floors and Marja cooking the meals. In 1897 she received a present of a ton of pitchblende, a kind of ore, and set to work treating it with tons of chemicals and water in order to extract radium, the presence of which she had discovered. For months she continued the

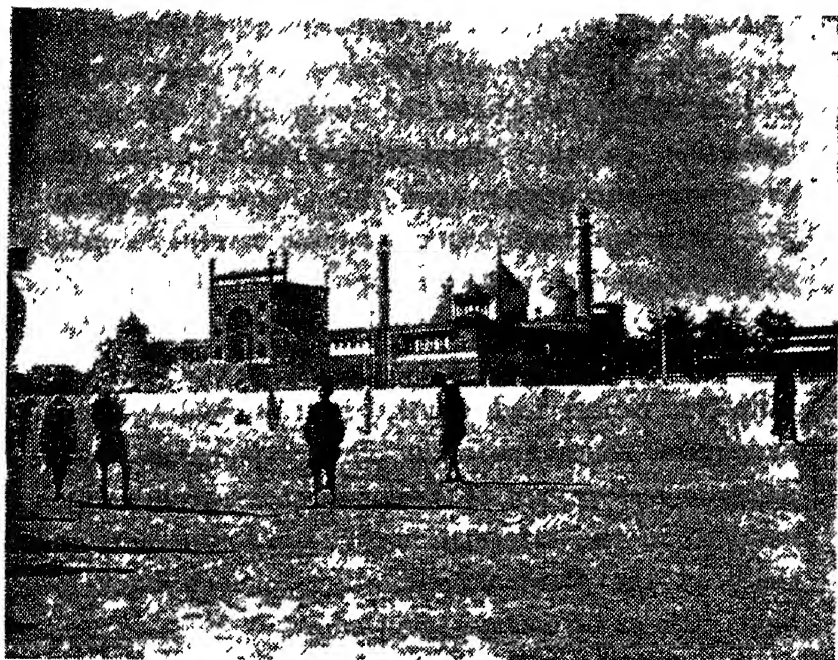
work and nothing could stop her, not even the rain which dripped upon her from the leaky roof of her wretched shed. When the radium compound was extracted it proved to be a dangerous thing, for it corrodes the flesh, and must therefore be kept in exceedingly minute quantities. Yet it has proved of immense value in curative surgery. At one time, before its effects were well understood, Monsieur Curie's hands were so injured by it that he could not hold his knife and fork at dinner; while many who have since experimented with the substance have been seriously injured and a few have lost their lives in consequence. Madame Curie is now Director of the Physico-Chemical department of the Paris University.

There are at least two Indians at the present day who are in the front rank of the world's scientists. Doctor Sir Prafulla Chandra Ray and Sir Jagadish Chandra Bose. Doctor Ray studied as a boy and young man in Calcutta and Edinburgh, and in 1889 at the age of twenty-eight became professor of Chemistry at the Presidency College, Calcutta, and such was his devotion to his laboratory that nine years later his first scientific publication, "Chemical Research at the Presidency College", at once established his reputation as a great scientist. In 1895 he rose to fame by his discovery of mercurous nitrite, on which he was congratulated by Roscoe, Berthelot and other great European scientists. The discovery led to many others made by

himself and his pupils, several of whom have gained the D Sc. Degree of London University by original research. Doctor Ray has also studied ancient Hindu Chemistry, and his great book on the subject opens up another chapter of India's lost greatness which is now to be revived by her patriotic sons, and he has also entered into business and done a great deal to revive industrial Chemistry in India. Not the least charm of this great scientist is his simplicity of life and his love for his pupils, to whom he is as an affectionate father as well as a staunch friend and patient teacher.

Sir Jagadish Chandra Bose became professor of Physics in the Presidency College, Calcutta, where he found no laboratory worth the name, but nothing daunted he contrived to set up a private laboratory in which he worked. In 1895, ten years after he had taken his Degree of Bachelor of Science in London, he began to contribute the results of his researches in electricity to "The Journal of the Asiatic Society of Bengal". Shortly after this the Royal Society in England published one of his articles and gave him money for carrying on his work, and in 1896 they were amazed at the results of his year's researches, on account of which the University of London bestowed upon him its degree of Doctor of Science. At this time he was experimenting with wireless telegraphy with great success. But it is in his research on the life of plants that he has made his name world-famous,

for he has proved that there is no sharp dividing line between the nervous life of plants and animals, and even of minerals, as we have seen in an earlier lesson.



THE JAMMA MASJID, DELHI

CHAPTER XIX

EXPLORERS, PRODUCERS AND MERCHANTS

WHEN we take up our geographical text-books in school we do not sufficiently realise three things: how this geographical knowledge came to be collected, and how it affects our lives and our minds. We owe its collection to the courage and skill of intrepid explorers who have ranged over almost every part of the earth and have brought back a careful record of their experiences, and to prospectors of all kinds who search for precious stones, gold, silver, coal and other valuable minerals and metals, and map out routes for railways, canals and roads. In this field of human endeavour there are many illustrious names in the pages of history, but of those earlier researches which resulted in the information given in scraps here and there in the Purānas and other ancient books we have little or no certain knowledge.

The people of Europe think much of those heroes who set out across the Atlantic ocean somewhat more than four hundred years ago and discovered America, and you will sometimes hear Europeans say that America was unknown before that time—a very

curious expression, for America was always well populated and in the past was the seat of magnificent civilizations which have decayed in the course of time, as some Hindus would say because the souls of the leading men who lived there have gone over to Europe and entered new bodies in order to obtain a new type of experience and training. The stories of the discoverers of America are full of courage and perseverance in the face of thrilling danger and frequent depressing failure. The name itself comes from that of an Italian, Amerigo Vespucci, who sailed across the Atlantic in 1499 and explored the coast for many hundreds of miles. Columbus, a Spaniard, landed on the mainland of South America in 1498, and in the West India Islands several years earlier, and Cabot had also landed in North America in 1497. But Amerigo did not know this, for the matter had been kept a State secret in Spain. So imperfect was geographical knowledge in those days that Columbus thought he was in India, and that is how the inhabitants of America came to be called Indians. The life of Captain John Smith, who conducted an expedition to Virginia about a hundred years later was one of the most adventurous, for he fought on land and sea, played pirate, suffered as a slave, and finally became Governor of the colony, after being saved from the Red Indians by Pocahontas, the famous daughter of an Indian chief, who afterwards went to England with one of the white settlers whom

she had married. Long after the white men had settled in the land there was still much exploration to be done, and the name of Fremont stands firm in the grateful memory of the American people for his untiring exploration of the far west and the Rocky Mountains, which has greatly helped in the planning of railway routes from east to west

For a long time much interest centered round Pacific exploration, and in that the name of Captain Cook, who was at first an errand boy in a shop, then joined the navy and became a famous navigator, and after a life of thrilling danger was killed by savages in the Sandwich Islands, stands pre-eminent. He discovered parts of Australia (though other Europeans had reached it as early as 1606) and many islands of the Pacific, and his follower Vancouver afterwards landed on the Pacific coast of America at what is now called Vancouver Island. In the same year as that in which Colombus landed on the mainland of America Vasco da Gama discovered the sea route to India from western Europe round the Cape of Good Hope, but that long route has not been necessary since the building of the Suez Canal, a work which we owe not only to De Lesseps, its famous engineer, but also to the explorers who marked out its route. Inland exploration in the Himālayas contains the name of Lander, whose thrilling experiences in Tibet included terrible imprisonment and torture. The same explorer also travelled in unknown Brazil, as did

Roosevelt of America. Hedin and others have made notable discoveries in Central Asia, but this is still largely an untrodden field. The lives of Mungo Park, Livingstone and Stanley in Africa are full of startling adventures; the first was drowned in the River Niger when his canoe was attacked by unfriendly savages, and the second died of dysentery after doing splendid work.

No more daring exploits can be found than those undertaken in search of the North and South Poles of the earth. Many are the names of Arctic and Antarctic explorers who have suffered terrible privations and in many cases death in their attempts to cross frozen lands and seas amidst terrible cold and treacherous snow and ice. Only in 1909, after hundreds of years of efforts and of increasing knowledge, was the North Pole reached by Commander Peary of the American navy. Two years later Captain Amundsen, a Norwegian, reached the South Pole, and one month later Captain Scott and his party of four also arrived there, but died from starvation and exposure on the return journey.

Very great is our debt to all these explorers and those others, hundreds in number, whose business it has been to prospect the routes of railways across the United States, Canada and Siberia, and the new routes through the wild forests of Africa and across the terrible deserts of Australia, the route for the new Panama Canal and hundreds of smaller

undertakings of the kind. By all this not only is the whole of humanity brought into a close communion in which they are learning to know themselves as one great family, but our minds are enlightened and our ideas expanded beyond those narrow bounds which confine those who are ignorant of the geography of the world.

These explorers and prospectors have been in most cases the advance agents of producers and merchants, who in turn have brought the raw materials of Nature into useful form, and have distributed all over the world the goods thus produced. This principle was well illustrated in the relation between Watt, the inventor of the steam engine, and his partner Boulton, a keen business man with a good instinct for both production and distribution. Watt the inventor devoted his life to the improvement and adaptation of the steam engine, but it was the business ability of his partner Boulton which gave scope for its varied development, its application to an increasing number of industries and its large production and wide distribution. Similarly the explorers of Central Africa led the way, though unconsciously, for rubber planters and other producers, and they in turn required travelling and stationary merchants to distribute their products. Explorers, producers and merchants are thus a trinity concerned with material wealth or prosperity, and by their discoveries of natural sources

of wealth and valuable raw materials, their organisation of industries and their development of commerce, they have enormously increased the producing power and the wealth of mankind.

In America before Rockefeller's time the oil trade was in a disorganised condition, there was very much waste and the oil was not well refined ; but he brought his business ability to bear upon the situation and organised what has become one of the greatest industries in the world, with the result that good lamp and burning oil and allied products from America were soon brought conveniently to consumers in every part of the world. The name of Perkin is famous as the founder of the huge coal-tar colour industry, which has so largely passed into the hands of the Germans because they have been more than all other people industrious in all businesses depending upon chemical science. Chemists and merchants in England, however, have now organised themselves so as to obtain a share in this great industry, in which no fewer than seven hundred colouring substances are produced. An interesting story is told of the courage with which a business agent brought over 250 secret German dye recipes from Switzerland to England. A Swiss chemist had somehow obtained them from Germany, and the English agent paid several visits to Switzerland in order to receive them from him. But each time he was dogged by Germans, who drugged his drink,

attacked him violently, threw him into the gutter by the roadside, and even followed him into France. He succeeded, however, in his dangerous task of bringing the recipes to England to be put at the disposal of the British Government. Every industry that has contributed to the prosperity of humanity has had its devoted and capable promoters, but we need not multiply names and examples when the principle has once been understood. The number of industries is legion, for almost everything that exists or grows upon the earth can be used to make something serviceable, and the very air itself is now being made to yield millions of tons of nitrogen compounds which are of enormous value to man.

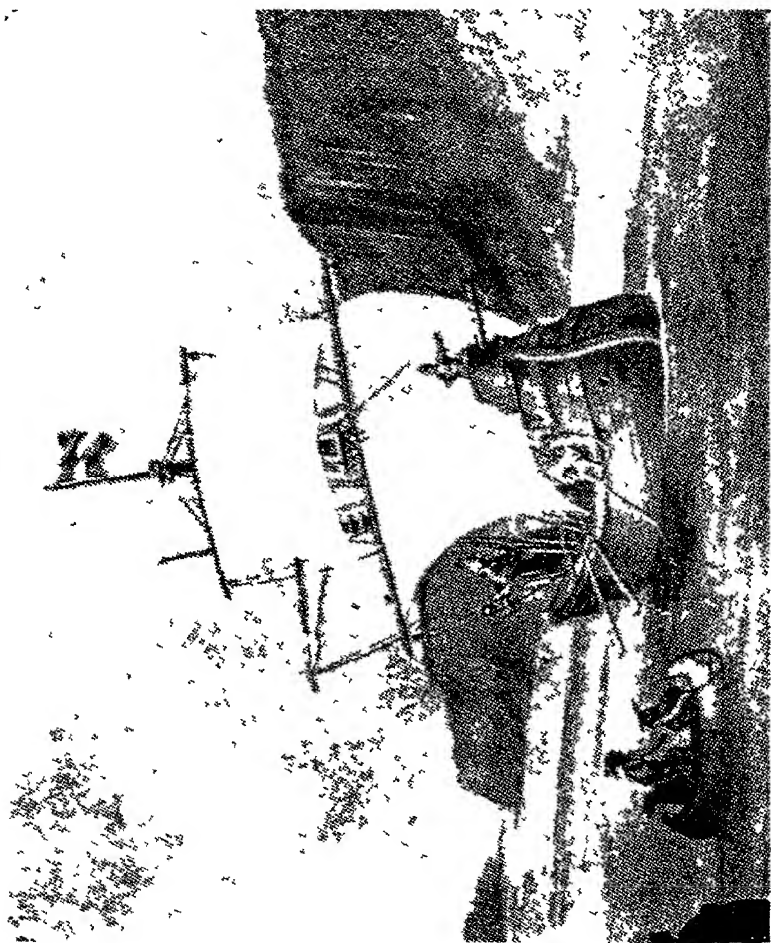
There are many examples of men of special business capacity who have become enormously wealthy so as to count their riches in millions of pounds, or dollars or rupees. In some cases this has been done by inhuman methods of commercial warfare, such as the case in which a large and rich trader sells his goods at a loss so as to ruin all the small traders and thus capture the trade, then puts up his prices and becomes enormously rich, and the case where a man secures all the available stock of some important article, such as rice or cotton, and then sells it at a great profit. But there are some cases in which great success has been achieved and great fortunes have been made by clever business organisation with some benefit to the public and the

workpeople as well as to the business man, and examples have already been set us of great manufacturers who have built garden cities, clubs and libraries for their workpeople, and have even given them a share in the profits, and are thus leading the way to that syndicalism in which the manufactory is governed by a council of the workers, who employ the clever business man as one of their most honoured and well-remunerated workers, so that he becomes one of themselves instead of an independent king decreeing their fortunes by his individual will.

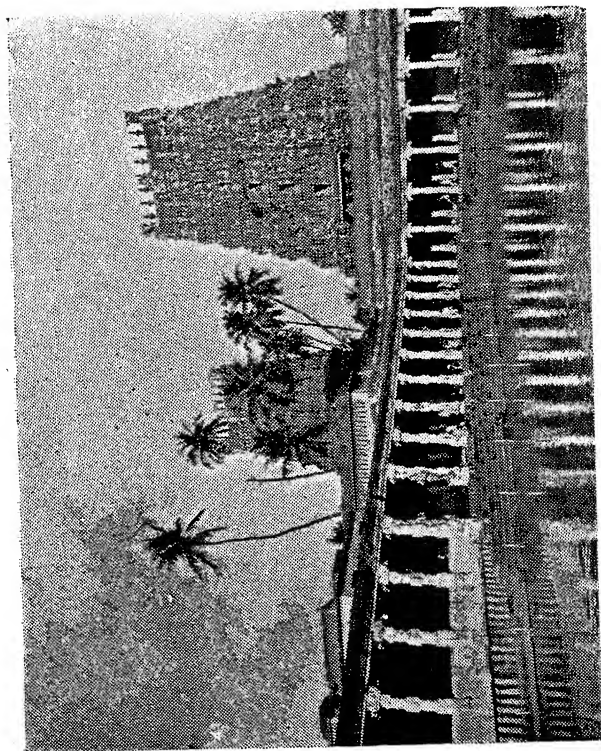
A curious instance of public benefit was that of the shop of Wanamaker in Philadelphia. Three generations ago in England and America it was the custom in shopping to haggle over the prices of all articles, which caused much inconvenience and loss of time, and must have been very annoying to a large section of the public, especially when we consider that the whole purpose of a retail shop is to provide the public with many articles near at hand and so save them the time and trouble of buying things in different places. Wanamaker started his store with definite fixed prices based upon a fair proportion of profit, and soon became known as a reliable man, so that all the timorous and busy people were very glad to trade with him, and he soon grew to be a millionaire and the owner of one of the largest stores in the world. Another example of merchant contribution to public convenience is that of the Sind merchants,

many of whom have become wealthy by travelling abroad and setting up their shops for the sale of Indian artistic and fancy goods and other things in all parts of the world. These men have shown that when Indian merchants from all parts of the country take to world travel they will do much to rebuild Indian trade and industries and earn for themselves much money that now passes into the hands of foreign agents who make enormous profits under present conditions.





To face page 270] MODEL OF HUDSON'S SHIP



A SOUTH INDIAN TEMPLE [To face page 271]

CHAPTER XX

MUSICIANS, SCULPTORS AND POETS

THE lives of great Musicians, Sculptors and Poets in our modern days are often full of difficulty and suffering resulting from their devotion to beauty, a path which is not severely regulated by the cautious mind, and in which the artist is led to prefer poverty and art to a position of affluence which he might gain in commerce or manufacture if he took to trade and left his art. The life story of the great artist is therefore often one of great struggle with poverty in its early days, until his genius becomes recognised by the world.

What is true of all great men is specially evident in the case of artists, that they are in contact with a world of being higher than the human and that they are in some sense channels from that higher world to this, or, to put it in another way, they are the wells which fertilise all the fields of human growth, drawing up from the depths of their being, where they contact spiritual things, the refreshing and invigorating waters of inspiration. A great musical composer, Handel, said that when he was writing

one of his religious songs he "Saw heaven opened and the great God Himself," and another, Beethoven, said, "Music is the link between spiritual and sensuous life; it is a more lofty revelation than all wisdom and philosophy," and we can realise the truth of their statements, only reserving our judgment that wisdom and philosophy are not excelled, for each path leads equally to perfection or to God, though it is right that to the devotee of beauty his own art should appear to be the supreme channel. We have but little history of the efforts of ancient musicians, and how they laboured and struggled to bring down the melodies and harmonies that surged within their souls; but we can feel sure that they shared with all true artists that delight of inward experience which made their genius, and that profound sorrow and sense of failure to express themselves fully which must be the lot of every true seer of beauty.

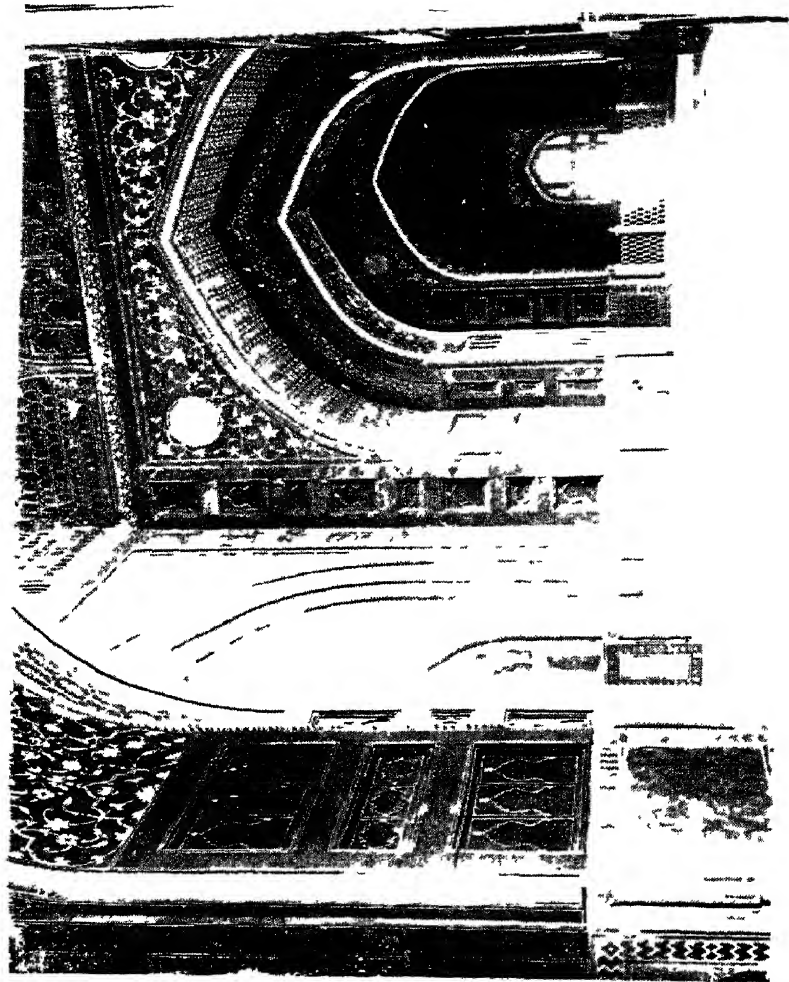
Taking music as our first group, we find a succession of great exponents in each of its departments, vocal and instrumental. Tradition holds that we owe the invention of the vīna or lute, the first stringed instrument, to the Rishi Nārada, the "Walker of the Skies" who travels from world to world inducing men to follow the divine purposes. There has been no time when man was insensitive to the uplifting power of music, and in the far distant past in India men enjoyed and practised it, inspired by Chitraratha and his Gandharvas, and by the

Gandharvaveda, which expounded the *Gitashāstra* or science of music for the early Aryan world. Most of the great names of the early musicians are lost, but we still know of Bhārata, who wrote his *Nāṭyashāstra* in the fifth century, Sārangadeva, with his *Sangit Ratnākara* in the thirteenth, who played their melodies upon two *vīnas* with twenty-two strings each, and Somanatha of the sixteenth century, who reduced the strings to four and provided the different notes by shortening the strings, by stopping them with the fingers at different frets

In our modern days, as earlier, some musicians show special power of composition, others of execution, and it is impossible to give the names, so many are they, of musicians and singers who are working at the art for the present delight of men, and improving it for generations still to come. To avert misunderstanding and prejudice, it must be mentioned that each type of music is of value—the melody in which the sound continuously flows and that in which the notes are distinctly separate and do not blend; the harmony which is a mere accompaniment or ornament to melody, and that which expresses itself in the magnificent volume and crash of modern orchestral music—and he is a poor devotee of music who in his liking for one form is inclined to slight the others.

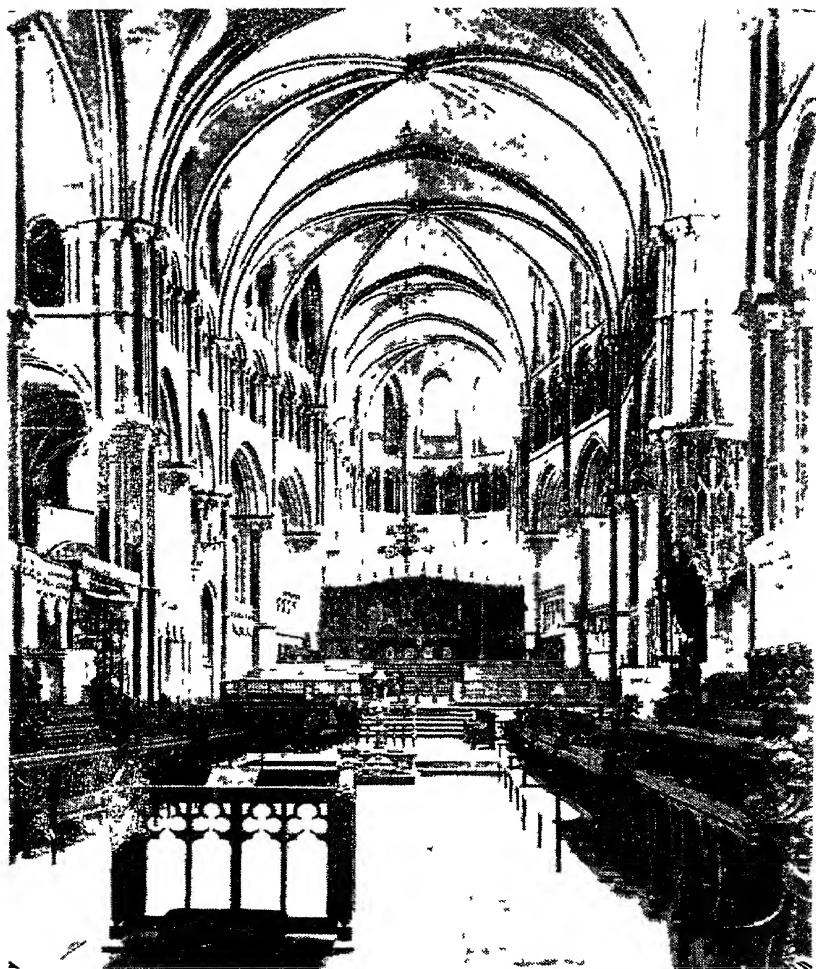
Nearly all the towns and large villages of South India are dominated by huge temples with *gopuras*

covered with detailed carving and moulding, and are beautified with tanks surrounded by artistic walls, while in the centre and north of India there are almost everywhere magnificent mosques with minarets and domes, palaces and tombs, and temples of a smaller type than those of the south. These magnificent erections, beautiful for size, outline and proportion as well as for detailed features of carving, remain with us as enduring monuments of former days when men sought ecstasy and revelation through beauty, and they are now a splendid instrument for refining, elevating and enlarging the emotions of all who live near them or visit them and are moved by their surpassing beauty. Who the architects and sculptors were we do not know, but looking upon their work we realise with what patience and perseverance they must have laboured year after year to make accurate and perfect every detail of their work. Writers of many nationalities combine to praise and thank those unknown artists for their labours, which will continue for thousands of years to be an inspiration to devotees of beauty throughout the world. In Europe, as in Asia the greatest examples of architecture were constructed in the service of religion in the form of cathedrals and churches and, in the earlier days in Greece and Rome, splendid temples such as the Parthenon of Phidias at Athens, while sculpture represented various divinities and the most perfect human forms. In this case we know more



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INTERIOR (INDIAN)



INTERIOR (ENGLISH)

[To face page 275

about the persons to whom our debt is due; in England, for example, to Wren, who gave us Saint Paul's, one of the most magnificent cathedrals in the world, and in Italy the famous Palladio who introduced what was for long thought to be the most perfect form of architecture. In sculpture Phidias and Praxiteles, who lived in Greece about two thousand and four hundred years ago, stand out pre-eminent to this day as revealers of the beauty that lies in the harmonious curves of the human form.

Allied to sculpture is the art of painting, which has had several revivals in India in different styles, among which must be mentioned the frescoes of the Buddhist age in the Ajanta Caves and the wonderfully delicate Indo-Persian painting of the time of Shah Jehan; but none have been more promising and more typical of Indian inspiration than the work of the new Bengal school of painters, of which Abanindranath Tagore is the moving spirit. So highly are splendid pictures now prized in the West that they sell sometimes for thousands of pounds, as in the case of Holbein's "Duchess of Milan" and Raphael's "Ansidei Madonna", which were bought for the British National Gallery for £ 72,000 and £ 70,000, an equivalent of over seven lakhs of rupees each.

In the same group come the arts of dancing and acting, which present us with living and moving statuary and pictures, and stand to sculpture much

as singing does to instrumental music. It is probably true also that dancing and singing are higher forms of art than sculpture and music, but less obtainable in a high degree of perfection, less emphatic to the untutored beholder and hearer, less permanent, and more dependent for preservation and development upon a continuous succession of teachers and pupils. In India the names of great actors have not come down to us, but in Europe there is a long list of illustrious actors and actresses.

We come now to our third group of artists headed by the poets, and including all writers of prose that tells more than its words because it is beautiful. These two, with those who write plays that are beautiful, are called literary artists. In this field of art India has held the palm from ancient times, thousands upon thousands of years ago. Tradition states that Vālmīki was the first poet and the father of poetry, and when one recalls the marvellous power for good that the Rāmāyana has exercised for thousands of years over the millions of people of India, by its high moral teaching enforced and interpreted by its magically beautiful verse, one realises something of the debt we owe to that great sage. To Vālmīki, hail; and also to his humble followers in literary greatness and beneficence Tulasidas, who rewrote the Rāmāyana in Hindī, and thus produced the national work of the Hindī-speaking people, Shridhar, who did the same for the Mahrattas, Mukundarama

and Bharatachandra who wrote for the Bengalis, and the Sittar school of poets for the Tamilians. Among the Sanskrit poets must be mentioned above all the great Kālidāsa, sometimes called the Shakespeare of India, though really we ought to call the great national English poet Shakespeare the Kālidāsa of Europe, for Kālidāsa preceded Shakespeare. Other great literary artists there have been in India, not by ones and twos, but in great numbers, who have enriched the speech and the minds of this great country, and through it are exercising a distinct influence on the rest of the world. Emerson, the greatest literary man of America, who has affected the aspirations and conduct of the entire nation, acknowledged his debt of gratitude to Indian literature, and when he was advising young men on the best books to study he exhorted them not to miss the translations of great Indian works, whatever else they might fail to read. Rich then is the Indian heritage, and our prayer must be that India's sons and daughters will ever drink in the rich nourishment of their motherland's literary store, for the sake of future generations and for the benefit of a surprised and almost incredulous world.

Probably the greatest living poet is Sir Rabindranath Tagore who a few years ago received the Nobel prize of £8,000, which is given each year to the one who is considered to have done most benefit to mankind in the field of idealistic literature. Sir Rabindra's

contribution to world progress is beyond estimation, for he has taught the doctrine of gentle trust in life and in the fulfilment of life by death not by any teaching, but by making us feel and see the truth that he feels and sees, and thus bringing us to a new outlook on life and a re-valuation of its gifts and experiences. The gentle peace of his life and thought indicates great power in the soul, like the giant cranks of our ocean steamships which move with a clean and irresistible stroke, and there is silence but for the throp of pistons. It is he who has most helped to make the poetry of the present day rank with the greatest that the world has yet seen. Young sons of India who wish to follow him in the path of poetry will do well to remember that he thinks and composes only in his own mother-tongue, and but a small portion of his work has he translated into world-wide English.



PART IV

THE FUTURE

- 21. The Past and the Future.
- 22. The Result of Gratitude



CHAPTER XXI

THE PAST AND THE FUTURE

THE course of life stretches before us like a chain, one end of which is called the past and the other the future, while these are linked together by what we call the present. Every link in the chain is attached to the link that goes before it, and to that which follows, and as these links of the chain of time follow one another and are attached to one another we speak of the chain as one made up of causes and effects. Each link or each day is an effect of the one that precedes it, and the cause of the one that follows; the things that happened yesterday and all the days that went before it are the cause of what happens to-day, and of this to-morrow and all future days will be the effect.

It has also been said that each one of us finds himself upon a ladder, which is so long that if we look downwards into the past or upwards into the future the ladder stretches altogether beyond our sight, and as we climb up into the future we leave more of the past behind us and gather strength for

swifter climbing by the efforts that we at present make.

The simile of the chain gives up a valuable idea of the unbroken continuity of causes and effects, and that of the ladder contains the idea of progress towards something higher or better which is to be reached by our own efforts.

If we look at the lives of the men all about us we shall see that they are climbing on the ladder of progress as they go on day by day from the past to the future, and that some of them are high up on the ladder, such as the great Religious Teachers, Statesmen, Poets and others whose lives we have been studying, while others are lower on the ladder, like the great bulk of men, and others are still lower, such as the savages. The mark of these lowest is their lack of intelligence, of love for humanity and of ability to do many things, for these are the powers that we develop as we ascend the ladder of progress, and the more quickly a man develops his ability to understand life and things, his love for living beings, and his power to create material objects, the more quickly does he climb

Though some of humanity are high on the ladder and others are low, the whole mass of mankind is slowly moving upwards, and all the humanity of our earth will some day arrive at the summit of the ladder. If we take a third simile, and think of humanity as a long procession passing, let us say, along a road from

Cape Comorin to the Himālayas, with the head of the procession to the north and the tail to the south, we shall be able to understand that the time will come when even the tail will have reached the mountains and the entire procession will then be threading its way amid the glorious heights. When that time comes we shall have reached what some writers have called the millennium, when all men will be good and wise and strong, and human life will be flooded with perpetual happiness

It is true that we cannot see the top of this ladder of human progress up which we are all climbing, yet we know that there is a top, for each thing has its perfection, and the human state is no exception to the rule. For example, we cannot improve upon the beauty of form and the sweetness of perfume of the rose, and we cannot improve upon the love for humanity shown by the Lord Buddha, the Christ or Muhammed, nor upon the wisdom of those who gave us the Upanishads and the Bhagavad-Gītā. Hence it is taught by the great Religious Teachers that when a member of humanity has reached human perfection he passes on into some godlike state, and this is reached either by repeated incarnations in human form or by progress in a heavenly world after the natural or physical body has been set aside by death. So the front of the great human procession has long been lost to sight in the heights of super-human perfection.

Knowing these things we, as members of humanity standing somewhere on the ladder, somewhere in the procession, possessing some ability to understand, some degree of love for living beings and some power to do things, set our faces towards the future, resolute to make speedy progress. There is only one way to do this, and that is to follow in the footsteps of the great men and women whose lives we have been studying, to make the fullest use of all the knowledge and power that they have gathered for us, and to preserve these things and hand them on improved and increased for the use of generations of humanity yet to come.

One result of the study of all that we owe to the past is that it awakens in our hearts a sense of great gratitude for what has been done, and a strong desire to do something in return. We have received from the past, and now we must give to the future. Our manner of giving to the future involves the two things already mentioned—we must hand on to posterity unimpaired the treasure that we have received from our ancestors, and add to the treasure as we hand it on. We are but the custodians of the treasure for a brief time; we are not irresponsible proprietors, at liberty to neglect, waste or destroy it.

For want of care a portion of the treasure has sometimes been lost, as in the terrible calamity that befell India when Aurungzeb destroyed the magnificent empire which had been built by the wisdom and

courage of his great-grandfather Akbar. A good example of loss in smaller matters comes to us from ancient Egypt, where no means were taken to preserve a knowledge of the manufacture of the indestructible cement used for the pyramids and ancient aqueducts, or of the bright purple, red and blue colours used for the pictures on the walls of temples and tombs, which were so unfading that they remain as bright now as they must have been when painted thousands of years ago. We cannot now produce such colours and such cement, nor such beautifully tinted stained glass as has been found in ancient cathedrals, nor such fine steel as that once manufactured in India for Damascus sword-blades, which could be twisted like a cork-screw without breaking.

We have seen in an earlier lesson how the circulation of the blood was known to Sushruta, but dropped out of sight of Science and was re-discovered in Europe a few hundred years ago. Doctor Ray has pointed out a number of useful chemical compounds which are mentioned in Sanskrit books, but have been lost to Science for hundreds of years. It is only recently, too, that in the West the theory that many diseases are due to germs has been re-discovered, though Sushruta said that germs of different forms breed in the blood, etc., and that some of them circulate in the body along with the blood, and some are roundish, reddish and legless, while others are too small to be seen by ordinary sight. He also said that malaria

and kindred fevers are caused by creatures like mosquitoes, fleas, bugs, ticks, ants, sand-flies and lice.

It sometimes happens that manufacturing secrets die with their discoverer, who will not impart them because he wishes to profit by them himself. Such is the case with the manufacture of some kinds of glass of which the Japanese possess secrets, so that they have been able to win a large part of the Indian trade. It is but natural that the man who goes to the trouble and expense of making experiments which result in discoveries should have a living reserved to him, and to ensure the discovery to him every civilised country has now Patent Laws, by which the right to reproduce is reserved to the inventor for a certain number of years, after which the discovery becomes the property of all.

The preservation of valuable ancient monuments has now become a great care, and in this country much has been done to preserve and render safe the splendid buildings which remain to show us something of India's past greatness and to inspire humanity with ideals of beauty and magnificence, while smaller objects are gathered into museums. During the recent great European war one of the German acts which roused world indignation was their careless destruction of magnificent cathedrals and other public buildings which were priceless treasures not only to the people in their neighbourhood, but to all humanity. In the English language we have the

word vandalism, which indicates the destruction of objects of universal value, and is derived from the Vandals who conquered Spain, France and Rome fifteen hundred years ago and earned the undying disapprobation of an outraged world by their wanton destruction of beautiful things. One of the greatest losses that humanity has sustained was the destruction of the library of four lakhs of manuscript volumes at Alexandria two thousand years ago, when Julius Cæsar, the great Roman general and statesmen, set fire to the city.



SPHINX AND PYRAMIDS

CHAPTER XXII

THE RESULT OF GRATITUDE

GRATITUDE to the past inevitably moves us to desire to play a good part in the procession of life and as we have received well from the past, to give well to the future. In the art of giving well there are three good things to be considered—an occupation, an ideal and a virtue. In our study of the benefactors of humanity we have observed five groups of men, in each of which there were several varieties, and all these did good to humanity because they had a definite occupation, such as that of a judge or a poet, a definite ideal, such as liberty or beauty, and a definite virtue such as justice or harmony. It is not competent for any one of us to do everything well, for our powers of mind and body are limited, and it is therefore best to have one particular occupation, though variety and change are necessary for the sake of refreshment, as, for example, one who is a merchant during the day may spend his evenings in the enjoyment of music or poetry, or in promoting social reform. But there must be one chief occupation, one thing done really well. There is a well-known story of a foolish Emperor of China who

wished to see the nightingale which sang with such enthralling rapture, but was greatly disappointed when the little brown bird was shown to him, for he had thought that a bird with such power of song must be far more beautiful than the peacock itself. Well, some of us may be peacocks and some nightingales, but there are few indeed who can hope to be peacock and nightingale all in one. Therefore must we choose in which of the five groups we shall be placed. We cannot choose on the ground that one is the best, for all are equal, but we must be guided by our own abilities and tastes or by the needs of the world about us and any special ability that may be ours. The nightingale is not better than the peacock, nor the peacock better than the nightingale, but it is best for the peacock to be a peacock and the nightingale a nightingale, each doing its own dharma and doing it well.

Every one who is travelling on one of the five paths with a definite occupation is helped on his way by a guiding star, which we call an ideal, and a practical virtue which prevents him from stumbling on his path. Thus the ideal of the first group is Liberty, of the second truth Health, of the third Knowledge, of the fourth Prosperity, and of the fifth Beauty. The virtue of the Statesman is insight into human character, that of the Warrior courage, and that of the Legislator and Judge justice. In the second group we have chiefly

love and peace ; in the third, truth and accuracy ; in the fourth, honesty and trustworthiness ; and in the fifth, unity and harmony or rhythm.

Just as there are three good things on the path of progress and benefit to humanity, which are definite occupation, definite ideal and definite virtue, so there are three great obstacles, selfishness, laziness and prejudice, which are to be avoided no matter what the cost. If a statesman works for self-aggrandisement more than for the benefit of the people, he will generally do whatever he can to keep possible rivals out of power, and thus diminish the amount of public good that they would have been able to do. An extreme case is that of Aurungzeb, who in his selfish pride grasped the reigns of power, imprisoned his father and killed his brothers, and then tormented the people with his foolish righteousness. No man can do really good work while thinking much about himself ; the energy and time thus spent are taken away from the pursuit of his ideal. From the lazy and vacillating person there is little hope of progress for himself or of benefit for others. He finds an excuse for every lapse of duty, puts off till to-morrow what could be done to-day, and disappoints those with whom he has made appointments. If you find this fault in yourself follow the advice of a philosopher who recommended young men to seek out every morning something which they felt disinclined to do, and straightway go and do it.

The third vice, prejudice, is that which clings to the past because its owner, or rather servant, has

made up his mind for all time about what is right and wrong, true and false, important and unimportant. While we strive to preserve the treasures of the past we must remember that not all that has come down to us is good and valuable, and that the future will surely improve upon the past in almost all things. We have to act as selective agents passing on what is good and dropping out what is not. Prejudice, blocking the way of human duty in this respect, has appeared in the world with dreadful results. On account of this Galileo was threatened with death for saying that the earth went round the sun ; the founders of modern Geology were denounced in Europe for declaring the immense antiquity of man and the earth, when people wanted to believe for ever that the earth was formed only six thousand years ago ; the terrible ecclesiastical court popularly known as the Inquisition put to death or submitted to cruel torture over three lakhs of persons for daring to use in the slightest degree their God-given intelligence in the expression of independent views on religion ; and to this day ungrown girls in India are made to suffer the consequences of early marriage, the penalties of widowhood, and the tortures of immature motherhood, in the face of its obvious folly and wickedness, and its absolute lack of necessity in our days of safety and good order. Our debt to the past can never be discharged by merely praising what has gone before or by blindly following its example, but by an intelligent admiration of what was good and a resolve to build still better and higher

on the solid foundation that has been laid. It is not sufficient that we should be proud of our ancestors; it is far more important that our descendants should be proud of us.

We have already studied examples of selfishness in the case of the canal owners who tried to prevent Stephenson from promoting railways because they feared that their own profits would be reduced, and in that of the people who smashed up the newly invented spinning and weaving machinery. Those who have set themselves firmly upon the path of progress must expect to meet with such opposition, for progress nearly always conflicts with private interests. For this reason alone there is one quality which every pioneer must develop to the full whatever may be the path that he has chosen, and that is the quality of courage, based upon his faith that what is better must ultimately conquer what is worse. As was said in the "Hitopadesha" long ago :

In good-fortune not elated, in ill-fortune not
dismayed,

Ever eloquent in council, never in the fight affrayed,
Proudly emulous of honour, steadfastly on wisdom
set,

These six virtues in the nature of a noble soul are
met.

Whoso hath them, gem and glory of the three wide
worlds is he;

Happy mother she that bore him, she who nursed
him on her knee.



From a painting by]

WORK AND WORSHIP

*[Jatmuni prakash Ganguli
[To face page 293*

STAGE III

OUR RELATION TO CONTEMPORARY MAN

PART I

THE STORY OF THE SHIRT

1. The Beginning of the Story of the Shirt.
2. The Story Continued.
3. "
4. "
5. "
6. "
7. "
8. The End of the Story.
9. Co-operation.



CHAPTER I

THE BEGINNING OF THE STORY OF THE SHIRT

AMONG the short stories written by Sir Rabindranath Tagore there is one that tells how several small boys were taught anatomy with the help of a human skeleton that hung against their schoolroom wall, and how, in the night, when one of the boys was sleeping in the next room, he heard in his dreams the voice of the lady to whom the bones had once belonged, and from her learned the story of those bones, or rather the story of her who had owned the bones when they were clothed with flesh and moved at her bidding in the world of living men and women. It is an instructive thought that somehow those bones retained the whole story of their experience, and in some ways it does seem to be perfectly true that all things do carry their history about with them.

In your study of Physical Science you may have learned about the photographic effect of light, which can be seen in what is called the pin-hole camera. This instrument is very simple and you can make one

yourself by taking a small box more or less square, pasting on it a piece of tissue paper instead of a lid, then making a hole in the bottom with a pin, opposite the middle of the tissue paper. Then, when you point the hole at any object and look from behind at the paper screen you will see there a picture of the object, and this will be very clear and bright if while you are looking you cover your head and the back part of the camera with a cloth to keep away the light from behind. It is the light that makes the picture, and light is always making pictures on every object upon which its rays happen to fall. The reason why you cannot see the picture when there is no dark box or camera is that there is too much light falling upon the screen from many objects all round, so that the multitude of pictures are merged in one bright impression. You will notice that when the sun is shining on the ground under the thick foliage of a tree, all the little spots of light are rounded, for they are photographic pictures of the sun. The open ground is covered with them, but millions are crowded together so that they cannot be distinguished.

We come, then, to the story of the shirt. Every morning before coming to school you don this useful article of clothing, but have you ever thought of the story it could tell if it were able to render up to you the pictures which have been impressed upon it in the course of its brief history? It would tell you,

indeed, innumerable stories of the cotton-fields, the spinning and weaving mills, the dyeing sheds, the warehouses and shops through which it has passed, in which it has been touched by human hands and the countless iron and wooden fingers of various wonderful machines, and of the lives of hundreds, perhaps thousands of people whom it has seen, and whose life stories of sorrow and happiness it has heard. This is the simple but astounding truth, that by wearing this shirt you receive some fruits of the labour of hundred of thousands of your fellow men and women, scattered perhaps almost all over the world.

Let us begin with the cotton field, where it first saw the light of day as a small, soft, white, fluffy, fibrous mass bursting from its pod on the bush, where it stood in one of the long rows which as far as the eye could see striped a great field with long white speckled lines. Here and there might be seen the cotton



pickers, men and women and children, who have put aside their THE COTTON PLANT agricultural labours for the season of the cotton harvest, moving slowly along the lines and gathering the white fluff and cotton seeds from the pods, taking care that they shall not be soiled by earth or by stains in the pod, and that the gathered material shall be free from dead leaves and twigs, which would reduce the value of the crop.

This might have been in almost any of the districts of India, which is the most ancient of cotton-growing countries, as the *Rig-Veda* and the *Manu Smriti* show, where for thousand of years the families of cotton growers have lived in their native villages. Or perhaps it was in Egypt, where the Fellaheen have learned to produce fine and long cotton by favour of Father Nile and a propitious climate; or in the United States, which supplies the bulk of the world's raw cotton, where in the southern parts the plantation negroes, descendents of slaves who were once torn from their African homes and carried across the sea to America by greedy and cruel slave traders, move from bush to bush with jolly songs and laughter, filling their baskets the while. There was a time, though, in the days of slavery, when there was little gaiety, for men and women were driven to their work with whips and threats of awful cruelty (as the Belgians until lately shamefully drove the rubber workers of the Congo) until nearly sixty years ago, when the people of the Northern States rose in indignation and freed the negroes by the great civil war of America which lasted about four years. It was during that time that cotton growing in Egypt and India began to be much extended, for there was then great suffering among the spinners and weavers of Lancashire for want of raw cotton, which had been coming from the Southern States, but which they had now to seek from other countries, for without it there

was no work and consequently no wages, but only widespread misery and starvation.

In due course some of the cotton gatherers draw near to our fluffy babe, and as swift hands move over the bush it hears something of the domestic pleasures and sorrows that occur in the cabins or huts down by the fields of rice or corn, where people rise early and bed early, and eat and dress simply, and work and play and suffer without much thought of past or future, and thus live and die like the passing of summer breezes. And presently a dark hand reaches out and gathers it into a basket with many hundreds of fluffy companions, all piled in a snowy heap, and the basket is carried perhaps to a cart where still more cotton lies in a great mass of tumbled softness, ready for new adventures in a wider world.

Yet our babe does not know of the preparations that were made for its birth, and of the great number of people who were concerned in that important event. Men laboured in the gloom of great iron foundries lighted by the red glare of huge furnace fires that never die, day or night, while iron runs like water from the crude ore which is thrown from high towers into the awful cauldrons, and others worked deep down in the darkness of the earth or in the forests to get fuel for the fires. It does not know of those others who worked with huge hammers and other tools striking and shaping the red hot blocks of metal and beating and cutting them into form of

plough and spade and harrow and hoe and all the tools and machines that were used to prepare the earth for the reception of the seed from which its parent bush has grown. And of the oxen and horses and men who have dug and ploughed and sown and harrowed and weeded it knows nothing, though they have contributed to its birth, and many have tended the growing plant and watched the coming forth of the masses of large yellow flowers, until their purple centres expanded and became large pods, and these in their turn matured and bursted, and their burden of seed and fluff emerged to the light of day.



CHAPTER II

THE STORY CONTINUED

(INDIAN HAND SPINNERS AND WEAVERS)

It is not altogether impossible that the shirt that you wear has been made of Indian cotton spun and woven in an Indian village, for there are still in India far more handlooms worked by the village people in their homes than there are power looms in the mills, and, though the village industry is declining fast, the hand looms of Hindus and Muhammadans still turn out many kinds of cotton cloths, including muslins of wonderful delicacy and great quantities of coarser fabrics very suitable for the use of the labouring people.

It may therefore have happened that the earliest adventures of our new born fluff include glimpses of many scenes of Indian life as it passes along the roads from the plantation to the villages where cloth is made. It may catch a glimpse of a country forge, where tires are being fixed on the wheels of country carts, and see the busy blacksmiths scattering the ring of fire and fixing the glowing iron upon the cart

wheel, while in a corner of the big thatched workshop stone wheels, brought by quarrymen from a distant hill, give sharp edge to knife or pruning hook, guided by the skilled hands of blacksmith's man or boy. Perhaps the cart on which it is borne stops on the way for the shoeing of its bulls, and stories of sturdy, honest blacksmith life are heard, and perhaps among these the deadfully unhappy one of money borrowed from the money-lender for some marriage or funeral, accumulating at high interest, filling the family with anxiety and bringing it steadily and certainly to ruin, when shop and tools will have to be sold to pay the money-lender, and the family will have to wander away from their native home to seek their food as hired servants elsewhere. Then the shoeing of the oxen is finished and the cart moves lazily on along the road, where men have toiled to gather stones and earth and beat them and roll them to make its surface hard, and others have planted rows of shady trees on either side and have dug wells at intervals for the refreshment of travellers and built shelters for their rest, until it arrives at the villages where many spinners and weavers live and work.

After having been stored for a while in one of the village godowns it comes into the hands of the spinning woman who bestows upon it the most remarkable care and patience, until it leaves her hands and passes into those of the dyers and weavers. First she sits down to the laborious task of combing the hair of

each individual seed in order to clean the fibres by removing every small particle of earth or vegetable matter that may be clinging there, and for this she uses in some places the jaw bone of a fish which has very fine teeth. Then she proceeds to separate the hair from the seeds by placing the cotton on a flat board and working a small iron roller to and fro over it, so that the long fibre is trapped between the roller and the board, and the seed is torn away from it when the roller strikes against it. This fibre from Indian cotton is of a kind specially suitable for her methods of spinning, though not so good for the use of the mills as the longer American kind which is less liable to break in the machine, and in which the little black seed has growing out from it many filaments of cotton as much as an inch and a half long, which come away from the seed very easily; while her seeds have long hairs from nearly an inch to just over an inch, and also very tiny ones which remain upon the seed and leave it fuzzy after the long lint has been removed. The cotton thus separated is not smooth and straight but each hair is twisted like a corkscrew, or something like an empty rubber tube that has been crushed and twisted round.

The third step in the work of the spinning woman is to tease the cotton by beating it with a small bow made of bamboo stick, and strung with a double string of twisted fibres of the plantain tree or of

catgut, until it becomes a mass of light downy fleece, which she then makes into a roll so that it may be held conveniently while she spins. The fourth step is the actual spinning, in which the wool is first drawn out and slightly twisted by hand, and then spun into compact thread on a small iron spindle, which has a ball, sometimes of clay, attached to it to give it weight and steadiness while it spins with its point resting as it turns upon a piece of hard shell or stone embedded in a lump of clay. Early one dewy morning, therefore, the cotton fluff now woven into your shirt, if it be a fine muslin one, may have found itself passing through the hands of a Hindu cotton spinner whose family for hundreds or even thousands of years have followed this occupation, so that their skill, resulting from the highly developed sensitiveness of their hands and their great delicacy of touch, has become a matter of wonder to the world. She sits outside her door before the sun has risen to drive away the dew from the grass, for the damp cool air enables the filaments to hold well together, so that she can spin thread that would be constantly breaking if she tried to make it during the warmer part of the day. So important is this moisture that if she sees no dew upon the ground, she will often place a large bowl of water near at hand.

The thread now passes into the hands of those who work upon it with various chemical substances for

dyeing the twist or yarn and stiffening it so as to make the work of weaving easy. In some cases it is steeped in a mixture of charcoal powder and water, then washed and dried in the shade and rubbed with a size composed of fine lime and water and parched rice, in which the husk has been removed from the grain by means of hot sand—a very ancient practice, for *Manu Smriti* says: “Let the weaver who has received ten palas of cotton thread give them back increased to eleven by the rice water and other things used in weaving.”

The yarn is now in the hands of the weavers, mostly men and boys, and it learns much of village life at this stage, for the long trestles on which the warp is set are often fixed up in the public roads or other open places, while the different colours are carefully set into line and the alternate strands are separated by sticks until the long warp threads are entirely in order, when they are carefully rolled up and carried to the loom. The roll is now transferred to a house or shed or verandah where a hand loom stands ready to receive it. The warp is placed in the frame of the machine, the thread of the woof is placed in the shuttle, and the busy click-clack of weaving commences, while the shuttle flies to and fro and carries the woof between the alternate threads of the warp as they move backwards and forwards, and so the cloth is built up under the care of the busy and watchful weaver

It has long been a matter of wonder that such marvellous weaving can be done on the hand loom, or indeed that such fabrics as the muslins of Dacca or the dopattas of Benares could ever be produced at all—so fine and exquisitely finished, yet so strong and durable. The art of the dyers has added to that of the weavers marvellous beauty of colour and design, delicate shades of blue, green, yellow, pink, mauve, violet and cream, and strong and decided scarlet and crimson, dark green and madder, chocolate and black, in backgrounds, stripes, checks and ornaments always beautiful and chaste, all of which emphasise the fact that in the past this industry has been doing the highest service to men, for it has provided many with an occupation which has developed their sense of what is beautiful and their appreciation of refinement, delicacy and honest careful work. Alas for this day that has come, when such industries are dying because all men seek what is cheap so that they may have more money to spend on luxury and excitement, and the very purpose of human life, which is quietly to develop all our best powers, is set aside, ignored and forgotten.

CHAPTER III

THE STORY CONTINUED

(GINNING)

ANY one who has paid a visit to one of the principal towns of the cotton districts of India must have seen many country carts heavily laden with huge square brown bales tightly bound with bands of iron, with here and there small tufts of white cotton creeping out through rents in the brown gunny coverings. At the nearest railway station many more of these bales may be seen, and in the great cotton stock yards at Colaba in Bombay city, huge stacks of these bales of cotton generally meet the eye, piled high in such mountainous masses that it seems as if so much cotton could never have existed in the world, yet it is only perhaps a few weeks' supply awaiting shipment abroad. This is that portion of the cotton crop of India which is destined for adventures in a wider field, for it may presently find itself floating on the wide ocean, *en route* for Europe, there to be spun into yarn and woven into cloth and tailored into garments which may or may not find their way back to their native land.

The first stage in this adventurous career lies within what is called a ginnery or ginning factory. Somewhere in the neighbourhood of the cotton fields there is a large whitewashed brick or stone building, with a roof made of large sheets of tinned iron bent into corrugations, and as the cart bearing the load of loose cotton approaches this structure, the chut-chut of engines and the whirling of many rollers and wheels reach its occupants. It is within that ugly, noisy building that great machines grasp the cotton lint and tear it from the seed and then make it up into the large gunny-covered bundles that we have seen.

There are several kinds of ginning machines in the factories, and all are but improvements upon the roller of the spinning woman whose work we have already studied. Before large factories came in there was a simple hand machine called a churka that was a great advance upon the roller, which is merely a tool. It consists of two rollers in contact, geared to revolve in opposite directions, so that when the cotton is fed between the rollers they draw in the lint and break it from the seeds, which cannot pass between them. With such a machine an expert worker can gin about five pounds of cotton in a day. One of the larger machines is called the Macarthy gin, from its inventor. It carries the raw cotton on a roller, to which the lint adheres because it is covered with leather. At a certain point the lint passes a fixed plate which stops the seed, and directly behind this plate there is a

beater or blunt knife which strikes with great rapidity, severing the seeds, which fall away, while the lint is drawn from the roller at the other side of the machine. With such a machine as this, turned by hand, about five pounds of cotton may be ginned in an hour, but if it is worked by an engine of one-and-a-half horse-power it can gin about sixty pounds in an hour, which results in an enormous saving of labour and time.

Another machine, the Whitney gin, still more powerful but less gentle in its working, contains rapidly revolving wheels with saw-like edges which rip the lint from the seeds as they pass, and carry it away. From these wheels the lint is in turn collected by a rapidly revolving brush and blown along a passage or tube on to a roller from which it is collected. Some of the American machines of this kind contain more than a thousand notched discs or wheels, and can do an enormous amount of work, but they are suitable only for short cotton because they are very rough and rude in their treatment of the lint and would cause much damage to the longer kinds.

The loose cotton-wool thus separated is next conveyed to a large press, in which it is compressed with such force that four hundred pounds of cotton are squeezed into a bale which occupies less than ten cubic feet. The purpose of this baling process is to render the cotton more convenient for transport in

carts, railway waggons and ships. How important this piece of work is will be seen from the fact that the United States sends about eight million large bales to Europe every year, and this lot requires nearly a thousand ships. If the compression were but half what it is, two thousand ships would be needed, as well as a double quantity of packing material consisting of jute sacking and iron bands.

At its present stage our cotton-wool owes its form



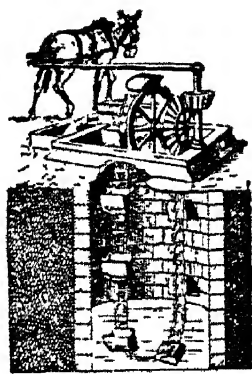
THE JUTE PLANT

not only to the workers whom it has seen in the ginning factory, but also to others of whom it may now hear from its neighbours, the jute sacking and iron bands; and many are the stories that it may hear on its way across land or sea, for the jute has had a life full of experience and adventure, though much more limited than its own. It must have come from

somewhere in the north-eastern corner of India, for jute has been cultivated successfully only in Bengal, Assam, Nepal and the neighbourhood, and though attempts have been made to grow it in China, Egypt and East Africa, they have all failed. India is fortunate in this, for jute is the cheapest textile in the world and is also very durable, so that it is constantly used in every part of the world for making bags, wrappers and packings for raw materials and manufactured goods, so that at the beginning of the

recent great war over ten million bales were produced in the year, and more than half of the supply is spun and woven in India into material for gunny bags and other wrappings, as well as mats, coarse carpets and ropes.

You may perhaps be curious to know what becomes of the cotton seeds which are thrown out in the process of ginning. They are by no means waste matter, for they yield valuable food products when they are squeezed and ground in common mills. The seeds that are left from a four hundred pound bale of cotton-wool thus produce over a hundred pounds of cotton-seed oil, over three hundred pounds of cotton meal, some short lint not useful for spinning, and a quantity of rubbish, which is finally used as manure. The cultivators also keep back a certain proportion of their crop to be hand-ginned for sowing.



CHAPTER IV

THE STORY CONTINUED

(IN THE SPINNING MILL)

WE will suppose that the bale of cotton whose adventures we are now to follow has been made up in the Cuddapah District of the Madras Presidency to which, along with the rest of South India, we must pay a passing compliment for good cleaning and ginning, and the production therefore of clean matted cotton which is liked better than that which is full of bits of leaves and other dirt. It may in all probability find its way, after a long railway journey, into one of the spinning mills or factories of the Bombay Presidency, for there are to be found there more spindles than anywhere else in India, turning out in fact more than twice as much yarn as all the rest of India put together. Before the great war it might have reached the port of Bombay and then proceeded to Germany by steamer, for Germany was buying from India nearly two million bales in the year, over one-third of India's total number of bales, whereas England was taking but one-sixth of a

million. We shall see the reason for that in a later lesson. In due course, after a longer or shorter journey by rail and perhaps by sea, it will find itself in the yard of a huge spinning factory, generally a long building two or three stories high with hundreds of windows stretching away in the distance. Its next move is from the yard to a lift—a little square room rough and unbeautiful like the rest of the factory, which rises with its burden and deposits it along with very many others in a huge barn-like chamber on the top floor.

The bale is now broken open, and the cotton-wool will have to go through the two general experiences of being combed and drawn out and then twisted into yarn, and these two operations are full of the most wonderful complexity. In the first stage, before spinning proper begins the matted cotton has to go through a number of machines which bear the unfamiliar names of openers and scutchers, carders and combers, and drawing-frames.

In the opener and scutcher there are three pairs of rollers covered with spikes or teeth to drag the cotton out or else fluted with grooves to carry it along. It is fed in to the first pair of rollers, then seized and pulled out by the second (which revolves more quickly), while the third pair makes it into a fluffy mass, and at the same time there is in the opener a strong current of air which blows out all the dust and dirt. Then the fluted rollers deliver a

lap or layer of this matted cotton to the carding-engine. This machine is full of cylinders covered with fine bent wire teeth which comb out the fibre, and there is something here to wonder at, for the machine may contain from six to seven millions of these bent wire teeth. One cannot help admiring the patience and skill with which these have been made and fixed, for if you were simply to count the teeth at the rate of a thousand in ten minutes it would take you three months to finish the machine if you worked without stopping for ten hours every day.

The wool comes out from this machine in a broad lap, combed and brushed and spread out uniformly, and is then delivered through a ring or tube which compresses it into a soft round coil which is called a sliver. This is taken to the drawing-frame, which contains four pairs of rollers, each turning faster than the last and thus drawing out the sliver and attenuating it. We will suppose that one yard of sliver has moved into the frame and that the fourth pair of rollers moves six times as fast as the first. The sliver would come out six yards long. If it were passed through the machine three times it would become 216 yards long, and if four times, 1,296 yards.

We now enter the spinning department proper, when the cotton passes from the drawing frame to what is called the slobbing frame—the first machine in which there is any twist. The sliver, further

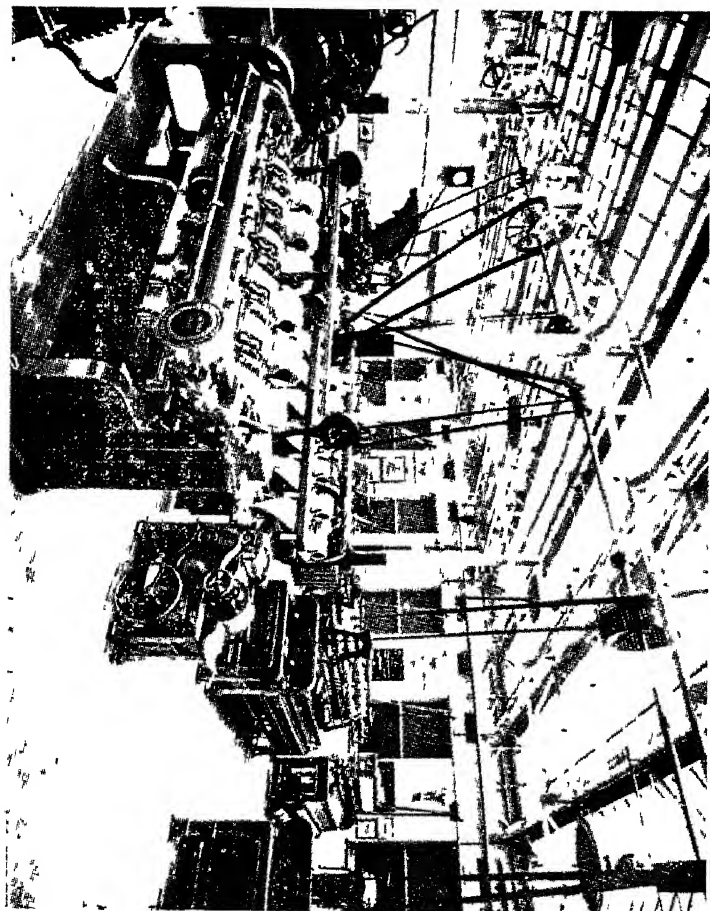
drawn out and twisted sufficiently to make it just strong enough to be wound on a bobbin is now called a slobbing. It passes next through what is called an intermediate frame, which draws out two slobbings to the thickness of one, gives this a slight twist and winds it on another bobbin, whence it passes to the roving frame, where it is further drawn out and again twisted and wound on bobbins. It is not necessary to remember the names of all these machines, for they are what are called technical terms—part of a little vocabulary belonging to the spinning and weaving industry, and not known by the general public; every trade and occupation has such a little dictionary of its own, in addition to the common words and language of general intercourse. What is useful to know and remember is that in this stage many men and women, girls and boys have to pay attention to machines which have become a success only because they work gradually and carefully. If the inventors and constructors of these frames had been impatient, and had wanted to spin the yarn straight away from the cotton-wool, or even from the sliver on one machine, without grading, they would never have been successful, for the touch of the machine upon this tender material is made delicate by these very gradual processes.

The roving or bobbin of rove now passes to the spinning room to be further attenuated and twisted and wound, by the 'throstle' or 'ring' spinning

apparatus if it is a coarse, stout yarn, or by the 'mule' if it is of a fine kind. In these machines there are rollers and spindles and bobbins—the first for drawing out the yarn by an increase of speed, the second for twisting it, and the third for winding it. As you pass through the spinning-room, and look at one of these mules you may be told by the man in charge that it contains as many as a thousand spindles, some of which are revolving ten thousand times in a minute. Nowhere else can one get such a dazzling experience of thousands upon thousands of wheels whirling round with almost incredible speed as in the spinning room of a large modern factory.

It may sound a good deal when we say that by throstle spinning yarn is produced of which 100 miles weigh only a pound, but the pound of yarn spun by the Bengal woman would go as far as 200 miles. When the mule was invented very fine yarn was soon produced, and with this machine in Manchester they have now reached as much as 350 miles of yarn to the pound. On one occasion, as a test of the possibilities of the machinery, a marvellously fine yarn was produced, of which one pound would stretch 4,770 miles, that is to say right round the circuit Bombay—Madras—Calcutta—Delhi—Lahore—K a r a c h i—Bombay, or in a direct line not very far short of the distance from India to England.

There are many smaller processes in which workers are engaged, such as that of doubling or twisting

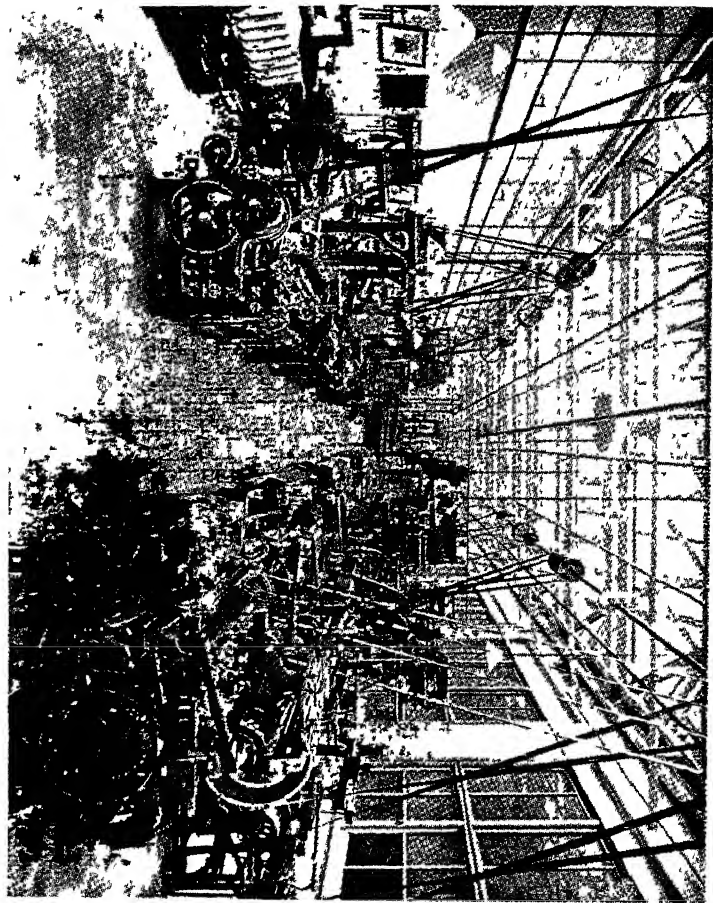


SPINNING ROOM

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WEAVING ROOM

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two threads together so as to oppose the spinning twist and thus gain strength, and the process of gassing in which, in order to obtain a smooth surface by burning away the minute protruding ends of fibres, the thread is passed through a flame. Finally, there is the reeling, in which the yarn is run on to bobbins for the use of the weavers, or made into hanks for the convenience of dyers, bleachers and others.



CHAPTER V

THE STORY CONTINUED

(IN THE WEAVING FACTORY)

WHEN one enters the weaving rooms or sheds of a great modern mill one is bound to acknowledge the marvellous change that has come over our industries on account of mechanical inventions. How different is the experience of the old weaver from that of the modern one, minding a machine in a large room where perhaps hundreds are stretched in long vistas, all worked by belts run over long shafts near the ceiling by means of which all the machinery of this vast workshop is worked from a single engine-house. How different it is from the time when a worshipper said: "Cares consume my mind, O Satakralu, although I am thy worshipper, as a rat gnaws the weaver's threads." (*Āig-Veda.*)

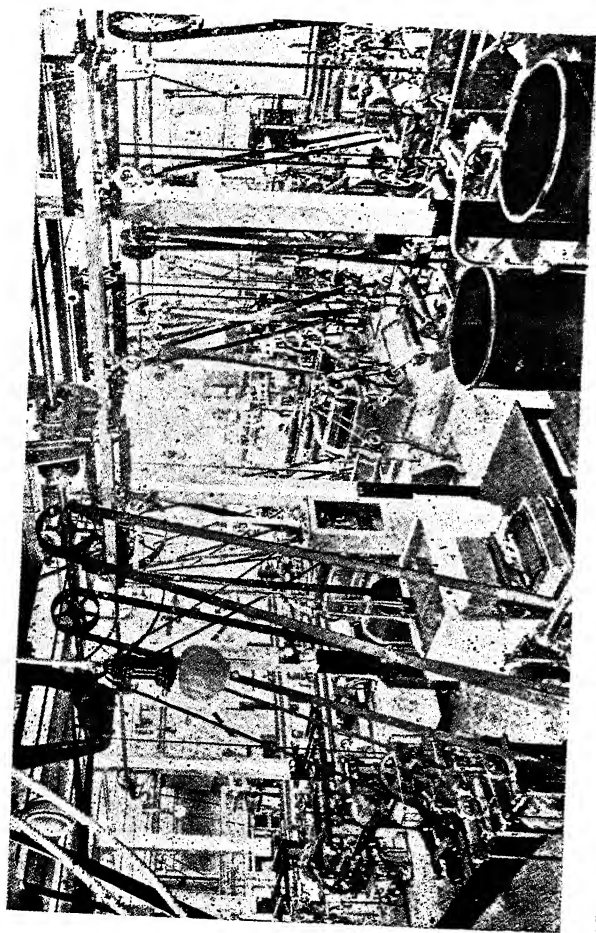
Some of the yarns that are brought into this department have already been dyed or bleached in the hank, before being prepared for the looms. We will suppose, for example, that there is a red stripe in the cloth of which your shirt is made. In that

case a portion of the yarn must have been to the dye-house and treated there with a vegetable dye, perhaps madder, or what is more likely, it may have been treated with a mineral and chemical dye, and may have passed through a solution of an aluminium salt, and then been soaked in a large vat containing alizarin dissolved in water, though the new red colour is produced with other chemicals. It has now a fast red colour, for the alizarin has combined with the aluminium compound in the fibre to form a red substance that will not dissolve in water and therefore will not wash out. It may require more chemical treatment than this, but here is enough to show that in this department our red dye presents the fruit of the labours not only of the dyers who work at the steaming, odorous vats, but also of the manufacturers of dye-stuffs, those who mine crude minerals in every part of the earth, and the chemists who have spent long, long years in studying their intricate subject and in experimenting with colouring matters and their effects upon different kinds of fibres. Here indeed is a series of ramifications which bring you in touch with hundreds of unknown fellow-workers.

Industrial dyeing has undergone a great change in recent years, from the use of vegetable dyes to that of minerals depending largely upon extracts from coal-tar. Since the war another great change has been taking place, for many new discoveries have

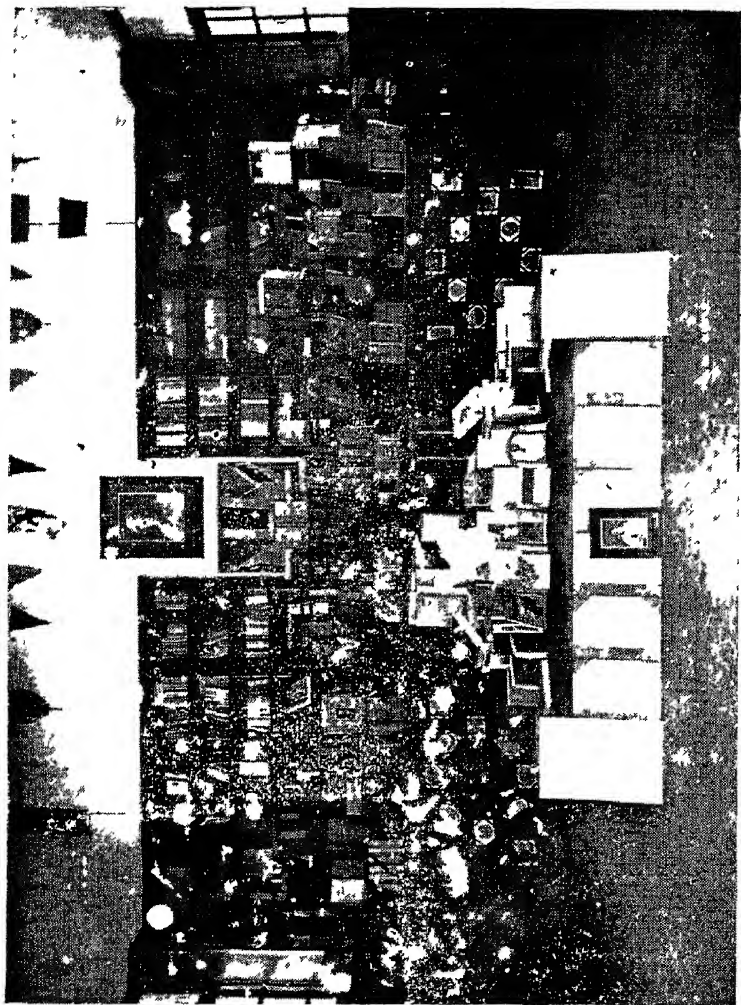
been made in this complicated art. Germany had paid special attention to the manufacture of dye-stuffs, and had secured the trade of almost every part of the world, but millions of pounds were spent in Britain for two years before the close of the war in order to develop the enormous experimental and manufacturing city of British Dyes Limited, whose buildings cover several miles. There is another industry which may also concern you if the material of your shirt is figured with a printed pattern, for it must then have been to the calico printer's works, have passed through printing machines in which rollers with patterns engraved upon them impress the cloth, and have there also experienced further chemical treatment.

The yarn is now ready for the weaving department, where it will be dealt with first by women winders, then by men sizers, and finally by the weavers, both men and women. In the first stage the threads are carefully arranged to form the warp in which they have to pass side by side through the loom according to the width of cloth required. Next, in order to give the assembled warp-yarn greater tenacity the sizers treat it with a glutinous or pasty compound. Thirdly, it is wound regularly round the beam or roller of the weaving frame, from which it will gradually wind off as the weaving goes on. Fourthly, and most important of all, the warp threads are placed alternately in the loops of the 'heddles'



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which lift up and down alternately every time that the shuttle passes, while the warp slowly moves along. Thus, for plain work, the series of movements is somewhat as follows: heddle A rises, bearing upwards warp-threads nos. 1,3,5,7, etcetera, while heddle B falls, bearing nos. 2,4,6,8, etcetera. This makes between the two sets of threads a space through which the shuttle runs. Now heddle A descends and heddle B rises, so that the warp threads cross and close upon the thread left by the shuttle that has just passed, and form a new space with the even threads above and the odd threads below. Through this space the shuttle runs back again, and so on. This process continues rapidly, at the rate of perhaps two hundred throws of the shuttle every minute, until the piece of cloth is finished and wound up.

When labour-saving machinery and the factory system were introduced in Lancashire the way was soon open for a much greater output of cotton cloth which could be sold at a much lower price than before, and the result in India was first that export to England declined and next that the cheap piece-goods from England began to come into India and affect the sales within the country itself. In due course, therefore, people in India began to establish spinning and weaving factories. The first was opened in Bengal between 1820 and 1830, and the first in Bombay in 1854, and by 1916 there were over 270 mills with five million spindles and fifty thousand

looms, employing over a quarter of a million persons, using over two million bales of raw cotton yearly, and weaving yearly over fifteen hundred million yards of cotton cloth, chiefly shirtings, long cloths, dhoties and sheetings. Yet there are still fifty times as many power looms in England as in India, though in India there is an enormous number of handlooms especially in Madras and the Central Provinces.



CHAPTER VI

THE STORY CONTINUED

(WORKERS AND WAGES)

WE have seen that the handloom industry of India has been able to survive to some extent the competition of the mills, but that was not the case in England, where the cotton industry is distinctly a foreign one and mechanical industries were more easily developed, so that the handloom has practically disappeared. Although Lancashire has a cool and humid climate favourable for spinning and weaving, all its raw materials must come from abroad and to maintain the present volume of its trade it must continue to sell eighty per cent of its manufactured cloths in foreign markets.

The cotton plant likes a light soil containing plenty of salt, and a warm moist climate, without any frost, and because all these conditions cannot be had in Europe it does not grow there. Before its introduction, following upon improved shipping and land transport, the textiles of Europe were chiefly wool, linen and silk. When cotton began to come into

England in quantity there soon sprang up a cottage industry like that of India, in which the cleaning, carding (or combing) and spinning were done by women and children in their homes, while the weaving was done on handlooms mostly by men, who used to throw the shuttle from side to side by hand. One hundred and fifty years ago in some parts of the north of England this home industry had grown to great importance, and engaged a large number of workers who turned to agriculture only for a few weeks in the year at harvesting times. Thus many farmers added the trade of spinning and weaving to that of agriculture so as to be able to pay the rents that their landlords demanded. After a time it became evident that rough agricultural labour was bad for hands that were required to do the delicate work of weaving, so more and more people took to the trade as their sole occupation. These were the people who suffered most when the spinning and weaving inventions came in and the industry was transferred from the homes to the mills, and it was they who were stirred up to the violent attacks upon the inventors which we have studied in the lesson on textiles and dress, Stage 2, Chapter 4.

This rough treatment of the English inventors was shared in France by Jacquard, whose loom for figured designs saved an enormous amount of labour. He too met with opposition and violence, so that on one occasion his machine was broken up and he nearly

lost his life. Napoleon, however, rewarded him with a small pension, and now, in the city of Lyons, on the spot where his machine was destroyed, his statue stands to mark the gratitude of posterity. Such ups and downs for the workers are almost inevitable in the course of industrial progress, and we have quite recently seen the motor-car oust the old horse-drawn vehicles from the streets of the great European and American cities, and what has become of many of the old horse drivers it is difficult to say.

The Lancashire mills thrived and multiplied, and in Great Britain there are now at least three million people supported by the cotton industry. Not less than four hundred million pounds has been spent on machinery, buildings and whatever else has been found necessary for carrying on the trade. About forty million pounds is paid every year for raw cotton, which is manufactured into yarn and fabric which sell for one hundred million pounds. Nearly four-fifths of the sales are for export, and thus the country receives about eighty million pounds annually from foreign sales, a good portion of which is in India. From this last fact it is not difficult to see how the old hand industry must have suffered, though in India it could not be completely wiped out by the mills, as was the case in England. In Dacca where after 1817 the trade began to decline, the population had been diminished to one-third by 1872, and the visitor

might then have found streets full of deserted houses overgrown with jungle.

Other countries followed the example of Lancashire. Before the great war Germany was manufacturing a large quantity of coarse cotton cloths from Indian cotton. Japan has also entered the field, and there has been a great increase in the number of Indian mills, which produce the less fine yarns and fabrics in great quantities. Thus the coarser trade has been steadily leaving Lancashire for some time, and that is why its demand for short-stapled Indian cotton decreased so that it came down to less than a hundred thousand bales in the year. Lancashire, however, with its excellent mule spinning, still holds its own for the finer cloths, for which the long-stapled cotton of America is best. The next move in this series of events is the attempt to lengthen the staple of Indian cotton by careful cultivation, for on the whole it has been found that the American kind does not grow well in India. Such is the way in which industrial changes affect one another, not only in cotton but also in most other trades.

When it was found in England that most of the machines could be tended by workers without much strength or skill, the employers of labour who owned and managed the factories desired to get richer as quickly as possible, and this led to much ill-treatment of children, who were forced to work hard and long in the factories. But a law was made that children

under nine should not be employed, and that the maximum hours of work in a week should be seventy-two. This meant that a child of nine might be kept at work for twelve hours every day for six days out of every seven ! What the conditions were before the law was passed may be left to conjecture. Such is the awful cruelty and wickedness which may arise when power is left in one man's hands or in that of a few.

As time went on laws to defend the weak and helpless became stronger, it was decreed that children under fourteen years old should work only half days or alternate days, so that they might go to school, the twelve hours' day was reduced to ten, a half holiday was fixed for Saturday, children under ten were excluded from the mills, and a beneficial distinction was drawn between young persons from fourteen to eighteen, and adults over that age.

In India the case of the workers is generally still very bad. Many of the mills work excessively long hours and the condition of the children employed in them is very distressing. Those over fourteen are often classed as adults, and thus growing boys and girls are made to work long hours indoors. In this case the electric light has proved a curse instead of a blessing (like scientific discoveries in the hands of the Kaiser) for the mills now work after sunset, which they could not afford to do before on account of the cost of illumination. And in the midst of all this misery the workers get perhaps one-eighth of what is considered in

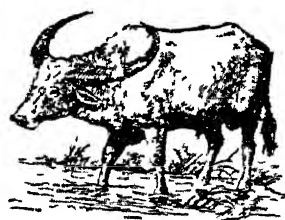
England to be fair remuneration for the same kind of labour, while the mill owners become millionaires. What chance of progress has this country while its people are kept in such poverty and degradation? Truly, as the *Hitopadesa* says :

As Age doth banish beauty,
As moonlight dies in gloom, .
As Slavery's menial duty
Is Honour's certain tomb ;

As Hari's name and Hara's
Spoken, charm sin away,
So Poverty can surely
A hundred virtues slay.

It is instructive to notice in closing what has been the effect of the factory system upon the workers' wages and the prices of cotton goods in England. Calico sold for six shillings a yard in 1837 was priced at sixpence a yard fifty years later, and in the same period the wages of the workers doubled themselves, roughly speaking. This would show considerable benefit to the cotton workers, if we assume that other articles had not increased in cost, as was generally the case, and especially if we could assume that the new cheap goods were as beautiful and as durable as the old ones, and that the conditions of labour were as healthful and improving to the workers as the old ones, which were generally not the case. Just recently wages have risen higher, but there is still much poverty because modern

civilization demands more expenditure on house rent, superior clothing, doctors' bills, amusements to counteract the monotony of factory life, clocks and watches, and many other things which did not trouble the old-time villager.



CHAPTER VII

THE STORY CONTINUED

(TRANSPORT AND TRADERS)

THE piece of cotton cloth which is ready to leave the weaving factory now becomes the subject of a series of business transactions. In the next stage of its career it is dealt with by the commercial office of the mill, sold and forwarded to the warehouseman, and sold and delivered by him in turn to the shopkeeper, who at last sells it to you. You are thus concerned with clerks and warehousemen, commercial travellers and shopkeepers, as well as a great variety of manual workers engaged in packing and transport. In the various offices of the mills, the warehouses, the banks, the shipping agents, the railway and steamship companies, there has been correspondence and book-keeping concerning this piece of cotton-goods, and to make the work of the many clerks who have done this possible, hundreds of workers have laboured somewhere else in this world at making pens, pencils, ink, typewriting machines, paper, files and account books, printed, ruled and bound, while others in turn

have worked to provide these workers with raw materials, machinery and tools.

We will now suppose that the roll of cotton shirting has come from Manchester to a small country town in India, and has had a journey by sea through the Manchester Ship Canal, past the famous port of Liverpool, down the Irish Sea into the Atlantic Ocean, past the coast of Spain, through the Straits of Gibraltar, along the Mediterranean Sea, through the Suez Canal and the Red Sea, and across the Indian Ocean to Karachi, Bombay, Colombo, Madras or Calcutta, followed by a journey across land by railway and bullock cart. What a vast number of workers are concerned in this business of transport. There are first of all the packers, who take the piece of cloth neatly rolled on a board, stamp it with the design of the maker or the merchant, wrap it up with packing paper and tie it with string, pack it with others in a great wooden packing-case, and swing it out into the street on to a waiting lorry. It is now carried to the docks, and the carter hands it over to the dock labourers, who bring it to the side of the ship, attach it to the hook or grappling iron of a great crane, where the crane-workers swing it up over the ship's side, a checking clerk notes its markings, and it is let down into the hold, where other labourers stow it neatly away.

The ship heaves anchor and is towed out of dock by a little steamer, the engineers and stokers make

up the fires and set the engines working, and the captain and crew guide and tend the ship, which at last reaches its destined port. Once more the ship's cranes begin their work, the packing case is hauled out from below, over the side of the ship and into the dockyard, whence labourers move it to the goods' sheds. The shipping agent now takes charge of it and it is transferred to a bullock cart and carried to a waiting train. Here another little army of workers appears, labourers and porters, guard, engine-driver, station master, goods' clerk, signalman and others, and all do their share in transporting the package away to the country station, where it lies awaiting the shopkeepers' bullock cart, which will finally bring it to his store. Many helpers, indeed, there have been on this journey, but they are few in comparison with the number of unseen workers—ship-builders, engine-builders, crane-builders, boiler-makers, chain-makers, canal diggers and masons, dredger makers and workers, canal lock minders, lighthouse builders and keepers, railway platelayers, bridge-builders, locomotive builders, waggon builders, cartwrights, wheelwrights and many, many others.

It is at this point that you come into the life-story of the shirt and play your part, for you now enter the cloth-merchant's shop in the bazaar street and make your selection from his neat little shelf of piece-goods suitable for shirts. When you enter you find the shopkeeper sitting patiently behind his little

cash desk in one corner of the matted floor, and now in answer to your request he quietly rises, reaches down the shirtings and unrolls a few yards of each for you to see, so that you may conveniently make your choice. When this has been done, he cuts off what you require and receives your money in exchange, and you go forth from the shop in quest of a tailor to make it up.

If you had been living in one of the great cities of England or America, and you had wanted such shirting cut from the piece you would probably have gone to one of the great department stores, where in one huge shop with a floor area of many acres you may buy almost anything that a householder can want, from a magnificent suite of furniture to a half-anna's worth of pins. In this busy establishment you enquire your way to the shirtings department, to which you are ushered with obsequious grace, and you stand or sit before the polished counter while the polite assistant shows you what you want, takes your money, and offers to send your parcel to your home.

CHAPTER VIII

THE END OF THE STORY

WE come now to that stage in the series of adventures at which the cloth is cut up by a tailor and stitched into the form of a shirt. In all the small towns of India, as you pass down the bazaar road, with its small open shop-fronts on either side, you will see here and there, in porches and verandahs and tiny shops, quite a number of tailors bending over their sewing-machines and working their treddles at such an alarming speed that you wonder that they do not run off the line of stitching every moment. You hand over to one of these tailors the cloth that you have bought in the shop; he measures you, cuts out the garment, stitches its parts together and adds buttons where necessary, and this simple series of actions brings you once more into touch with a large group of workers, including makers of scissors, knives, thread, needles, pins, buttons and sewing-machines, about whom you may not have had even a passing thought. All these things are full of interest, but we have time to study only one or two. Let us take the simplest—the humble pin.

First of all, iron ore must be got from the ground and carried to the great furnaces where the iron is melted out, and this must go in turn to a large factory where by a slow and complex process it is drawn into wire, in which form it is bought by the pin manufacturer. The end of a long coil of wire is now passed into a machine containing little rollers which press out small kinks and make it even, and then wind it on a large reel. This is next transferred to the machine that makes the pins, and when the workman puts into it the open end of wire, rollers grip it and pass it on till it touches a certain point, whereupon a cutter descends and chops off the length of a pin, a little hammer knocks it on one end and flattens it into a head, and it is pushed on to a wheel which is just the width of a pin and is grooved all round like the edge of a rupee, so that the pins rest in the grooves. As this wheel turns it rubs the pins against an outside band which turns then, past a set of rapidly moving files which sharpen them roughly, and then against grinding wheels and a prepared leather band which smooths the points, and at this stage they drop into a box underneath the machine at the rate of seven thousand five hundred an hour.

The next step is to make them bright, so they are washed in sulphuric acid (the product of another big industry), then mixed with sawdust and revolved in a barrel for two or three hours to make them clean and smooth. The mixture is now allowed to fall in a

stream, while a strong current of air is blown across, which carries the sawdust aside and allows the pins, which are heavier, to fall below. Now is brought into service an electric battery (which also has a history) and a current of electricity is passed through the pins, which are spread out in a tray containing a solution of tin. This deposits tin on the surface of each pin. Then follows washing in water, tumbling in hot sawdust in another barrel, polishing in a revolving copper-lined tub, where they rub against the sides, and finally comes the machine that catches the pins in slits where they hang by their heads, from which position they are thrust through the ridges of a strip of paper which has been prepared for them by still another machine. Thus they are stuck at the rate of perhaps ninety thousand an hour in the papers in which we find them folded in the shops.

The adventures of the buttons are also interesting. If they are of the small mother of pearl variety they have probably been manufactured in Hungary or France from the inner surface of the shell of the pearl oyster, which may have been brought from the bottom of the sea by a Sinhalese diver—who can tell?

In England the course of tailoring is somewhat different, for the ordinary cotton shirt is generally made in large quantities in standard sizes and sold ready-made in the shops. In the work-shop a large amount of cloth is cut to the requisite shape by means

of a big, sharp knife, and it is then sent to the sewing room, where many girls and young women work at machines, or to the homes of poor women who in their dire necessity make up the shirts for a miserable wage. Picture to yourself a room in a large old house in a crowded street. Here sits an old woman, ugly and wrinkled, dirty and untidy, almost beyond human semblance, and several younger ones destined for a similar age, all busy with their machines or hand stitching, and when you look round you see in one corner a dirty old bed on the floor that looks as if it had not been swept for months. Of these unfortunates Hood wrote in his "Song of the Shirt"

With fingers weary and worn,
With eyelids heavy and red,
A woman sat, in unwomanly rags,
Plying her needle and thread—
Stitch ! stitch ! stitch !
In poverty, hunger and dirt,
And still with a voice of dolorous pitch
She sang the "Song of the Shirt"

Work—work—work
Till the brain begins to swim,
Work—work—work
Till the eyes are heavy and dim !
Seam, and gusset and band,
Band, and gusset and seam,
Till over the buttons I fall asleep,
And sew them on in a dream !

“ Oh, Men, with Sisters dear !
Oh, Men, with Mothers and Wives !
It is not linen you're wearing out,
But human creatures' lives !
Stitch—stitch—stitch,
In poverty, hunger and dirt,
Sewing at once, with a double thread,
A Shroud as well as a Shirt

“ Work—work—work
My labour never flags,
And what are its wages ? A bed of straw,
A crust of bread—and rags.
That shattered roof—and this naked floor—
A table—a broken chair—
And a wall so blank, my shadow I thank
For sometimes falling there ! ”

The lot of the young women who work in large rooms attached to the warehouses is better than this, though it is not without its sad poverty. I remember hearing of an example in the north of England where many cheap cotton shirts are thus made for sale to the working population. The workshop was large enough and the hours of work were not unusually long, but the women were sadly out of health, and several of them were suffering from consumption. Yet they all had an unconquerable aversion to open windows and the admission of fresh air so necessary to health. When they were pressed to explain the cause of their objection to ventilation the truth came out—fresh air increased their appetites and made them eat more, and they had not sufficient money to buy the extra food. How much happier

the western world would be if each one who wears a shirt could say that it bore in its life history no taint of such sinful trade. Let us hope that the more humane feelings and the better industrial conditions which have resulted as a reaction from the great war will never again sink back into such a state as prevailed in the days of our fathers.



CHAPTER IX

CO-OPERATION

Small things wax exceeding mighty,
Being cunningly combined ,
Furious elephants are fastened
With a rope of grass-blades twined.

Hrtopadesha

CIVILIZATION is a state of human society organised for the humane production and just distribution of true wealth, including spiritual, moral, mental, emotional and physical riches. Civics is the science of civilization, and it should teach what true wealth is and how humanity is organised for its humane production and just distribution. It will be evident to all who have studied the story of the shirt that we live in a great civilization in which the organisation of humanity plays a great part in increasing its wealth, but that our civilization is far from perfect, for it not only produces much that is not true wealth (as, for example, intoxicating liquors in excessive quantities, and insincere religious and social doctrines) but also carries on its work with great injury to many animals and men, and without sufficient regard to a just

distribution of wealth, for which there is a big fight always going on (a fight with cunning as well as with the power of money and, occasionally, brute force) which is contrary to true ideals of civilization.

In the first two stages of this course of studies in Citizenship we have seen what man is and what is true wealth for him, the debt that we owe to the past and how it must be paid to the future. In the *Story of the Shirt* we have learned the meaning of organization, for we have seen how many persons are engaged with one purpose in view, each doing the work that is especially his. This idea of organization is composed of two others—co-operation and interdependence.

Co-operation means working together. It is seen in the rope of grass which tethers the elephant, as stated in the *Hitopadesha*. It is not seen in a chain, which is only as strong as its weakest link. It is seen in the play of a football team, where eleven boys help and support one another in a common purpose—to get the ball through the opposite goal—and it is especially evident when one player, instead of trying to shoot the goal himself, passes the ball on to another who is in a better position, or when several players run abreast up the field and each one who is tackled by an opponent passes the ball across to his neighbour. It is seen imperfectly when a number of tiny ants grab hold of a dead beetle and begin to drag it towards their hole, for each one pulls lustily at the point of which

he happens to catch hold—some at the head, others at the legs—so that their way of going is erratic in the extreme and there is much unnecessary heat and labour. In this case the intention is good but the intelligence required for successful co-operation is wanting. Co-operation is seen also in the stories that boys sometimes read of attacks by Red Indians upon the farmsteads of early white settlers in America, where one reads how the savages gather up a big tree trunk in their arms and rush it forward to batter in the door, but when two or three of those who hold it are shot down the whole trunk falls, for the remainder cannot sustain its weight. In all these cases it is not difficult to see that much can be done by co-operation that would be impossible without it.

Interdependence is well seen in the example of a large building or school-hall, where there are several parts, each performing its own special work. The three chief parts are the foundations, the walls and the roof, and if one of these be missing the school-hall fails of its purpose, for without foundations firm in the earth or on a rock the walls and roof would soon collapse, without walls or pillars the roof could not be supported, and without a roof the building would not protect us from sun and rain. But when each does its own true part, the foundations are firm and strong, the walls are sound and straight, and the roof is impervious to heat and water, it is well with that building. Here we see also different materials

doing their special work : concrete and brick and lime in foundations and walls, wooden doors and windows with iron hinges and bolts, and wood or iron beams or trusses resting upon the walls and supporting the tiled or terraced roof. A second example of interdependence is that of a sailing ship, which has a large hull for floating on the water and sails for holding the wind that drives it along. The sails are supported by masts, and the masts remain standing firmly in the hull with the help of ropes which are fastened to the sides of the ship. Another example is that of the human body, which has its several organs of action and sensation, each with its own special purposes—the legs for walking, the hands for holding, the eyes for seeing and so forth. Every one is familiar with the old story of the Indian philosophers about two men, one lame and the other blind, who were helpless when separate, but when the lame man sat upon the shoulders of the blind man and guided him, eyes and legs could serve each other, so that they were able to go out in search of food.

All machines, such as bicycles, carts and typewriters and many other common things, afford further examples of interdependence, which we have also seen very clearly in human life in the spinning and weaving mills, where each department has its own function and each worker the special task for which he is best fitted or trained. In the Story of the Shirt we have seen something of the interdependence of industries, how manufacture of cotton goods

depends upon the supply of raw cotton and means of transporting it from the fields to the factories, and how the supply of cotton depends also upon the amount required by the manufacturers (for if it is not wanted it will not be grown) and further how the cotton cultivator, the picker, the ginner, the spinner, the dyer, the weaver, the packer, the transporter, the shopkeeper, the tailor and others all have their special functions in the production of the shirt. In all this there is organization, co-operation and interdependence combined.



PART II

THE LARGER CO-OPERATION

10. Production : Food for the Workers.
 11. „ Other Necessaries.
 12. Organization.
 13. Protection : Land Forces.
 14. „ Sea Forces.
 15. „ The Department of Justice.
 16. „ The Rich and the Poor.
 17. Education and Instruction.
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CHAPTER X

PRODUCTION FOOD FOR THE WORKERS

WE have said that the story of the shirt is finished, and have seen that this simple article of every-day comfort brings us into touch with many hundreds of people who are living and working in India and in foreign countries. Yet there is a sense in which that story is not yet at an end, for it would not have been possible for all those who have worked upon the shirt to have done their respective parts without the help of many others who were engaged in the still larger work of providing them with food and all the other necessities of life. The sphere of co-operation is thus much larger than that great circle which we have already considered, so that it seems as if our relationship widens out to include almost the whole of civilized humanity.

When we study the life of the Indian village, then, we shall find that it is not only the spinning woman who rises early and the weaver who works hard and long, and the mill-hands who leave their homes for perhaps twelve hours' daily toil, but there are many others who co-operate in the work, foremost among

whom are the cultivators of food stuffs, descendants of distant ancestors who sung the following hymn as they pursued their calling thousands of years ago.

1. We will till this field with the Lord of the Field, may he nourish our horses, may he bless us thereby

2 O Lord of the Field ! bestow on us sweet and pure and butter-like and delicious and copious rain, even as cows give us milk. May the Lords of Water bless us.

3. May the crops be sweet unto us, may the skies and the rains and the firmament be full of sweetness; may the Lord of the Field be gracious to us We will follow him unharmed by foes

4 Let the oxen work merrily, let the men work merrily, let the plough move on merrily Fasten the traces merrily, ply the goad merrily.

5 O Suna and Sira ! accept this hymn. Moisten this earth with the rain you have created in the sky.

6. O fortunate Sītā (furrow) ! proceed onwards, we pray unto thee Do thou bestow on us wealth and an abundant crop.

7. May Indra accept this Sītā, may Pushan lead her onwards. May she be filled with water and yield us corn year after year.

8. Let the ploughshares turn up the sod merrily; let the men follow the oxen merrily, let the god of rains moisten the earth with sweet rains O Suna and Sira ! bestow on us happiness.—*Rig-Veda*, IV, 57.

The feeling that inspired this simple and joyous song long, long ago still exists in the villages of India, as it has done throughout the ages as generation has succeeded generation, even to thousands, and the land has yielded cotton, rice, wheat, sugar, vegetables, fruits and many other things, and has



A WATERSIDE MARKET

To face page 348



National University

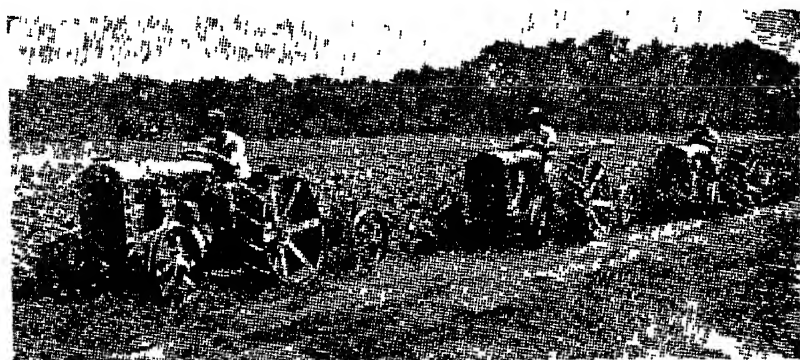
PLOUGHING A PADDY FIELD

[*Madras*
[To face page 349

fed, clothed and housed the simple joyous members of the village communities as they have coaxed it into bountiful kindness by their laborious and loving efforts. It is no lazy life, this of the village, and work and play alike are entered into with vigour and zest. At five in the morning the cultivators turn out to the fields, where they remain ploughing, sowing, watering and weeding and, when the crops are ripe, reaping, garnering, threshing and doing many other things. Except for a rest in the mid-day heat, their work goes on until dark, when they return to their thatched dwellings among the tamarind and coconut trees; but when the crop is ripening some of them have the duty also of remaining on guard in the fields throughout the night. These are the people upon whom rests the prosperity of all others, for they produce the staple necessities of life, though by a strange irony of fate they are generally the poorest in this world's goods and the first to suffer when drought or floods and famine harry the land.

The life of the cultivator in England and America is in many ways very different, for there co-operation in food production has reached a much larger development, with the aid of machinery and engines that have not yet come to India to any great extent. But just as there are now in India ginneries which separate the cotton-seed from the cotton-wool with great rapidity and ease, and also many spinning and weaving factories or mills, so there are some rice

mills, as they are called, which do the husking by machinery driven by steam or gas engines. It is not that in these respects India is essentially different from England or America. There is but a difference of time. India is now in the condition of the England of a hundred years ago, before the high co-operative development of interdependent industries. One of the chief reasons why the larger farmers of India do not use the labour-saving agricultural machinery of America is that there are not enough skilled mechanics to look after it and to repair it when it gets out of order. Distances in India are very great, roads are not good, rail transit is not cheap or convenient, and almost every country gentleman who keeps a motor-car knows that now



FARM TRACTORS

and then he has the great trouble and expense of sending it by railway to a distant town to be overhauled and repaired, and it has often happened with those who have bought new agricultural machinery

that after a little time it has got out of order and been put aside to rust and rot—a dead loss, because the iron industries of India have been neglected. The Indian labourer would be astonished at the sight of some of these machines which can do the work of dozens of men, and he might think it magic were he to see a great reaping machine, drawn



A FARM TRACTOR

by a motor tractor, pass over a field of corn in a few short hours and leave it bare but for neat stacks of reaped corn, and no less would be his surprise at the comical instrument that looks something like a barrel on wheels that digs a hole, moves on a few yards and digs another, or at many other of the machines for

ploughing, harrowing, threshing, planting, sowing, manure-spreading or grinding.

It thus happens that at the moment the cultivator of America is a very different being from his confrere of India, for not only has he had in the elementary school a liberalising education, but on the farm he learns to handle machinery and develop much intelligence thereby, though he loses much of the education by beauty and gentleness that is characteristic of Indian rural life. It is true that the farmer who uses the new appliances has very little more leisure and no less hard work than the one who uses the old, although his productiveness is enormously greater, but he has a better house, better food, better sanitary conditions and medical service, better means for educating his sons and daughters, a better chance of saving for old age, for times of difficulty and for occasional travel, and so is, in brief, better off, and leads a fuller life.

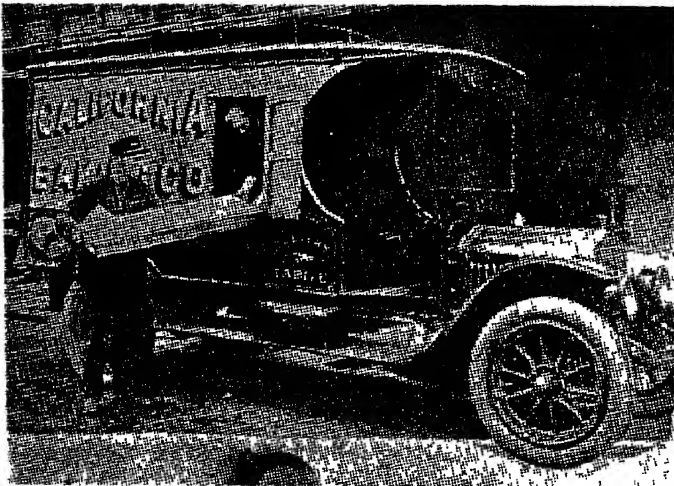
The change from old to new methods is only a matter of time in India also, for this country has begun to feel the effects of that world-wide change in agricultural life which has sometimes been called the agricultural revolution. This change was brought about largely by the improvement of communications—especially by the development of railway and steamship services. The Indian cultivator of a district like that of Tanjore in the Madras Presidency, for example, no longer thinks merely of supplying

his own family and immediate surroundings with rice, but he is anxious to produce as much as possible for export to other parts of the world, such as England, where rice cannot be grown because the climate is not favourable.

It is this awakening, indeed, that has caused much extra difficulty in times of famine, for the uneducated cultivator is tempted to sell off his rice for ready money, and there are no great stores in granaries as was the case in ancient times, and though there is always the railway to bring rice to a famine-stricken area from distant places untouched by famine, heavy cost of transit and delay in procuring waggons prevents it from alleviating the suffering of the actual labourers, who are also faced with the additional misery of being thrown out of work and thus deprived of the wages of their labour because the season has failed.

The cultivation for export of most Indian vegetables and fruits has not reached a great height, like that of cotton and rice, because the goods are perishable, and the undeveloped state of the metal and glass trades has not yet permitted large operations in the preserving and canning of fruits, such as have lately caused huge tracts of land in California to be covered with fruit farms which supply the world. Similarly, in many parts of America it is noticeable that the market garden areas for vegetable growing which exist round about large towns are extending further

and further away from the cities, because huge motor trucks are now manufactured in great quantities, and these swift vehicles can bring fresh fruit and vegetables, eggs and milk, into the towns early in the morning before they have had time to grow stale



4 MODERN QUICK DELIVERY VAN

CHAPTER XI

PRODUCTION OF OTHER NECESSARIES

THE study of wider co-operation brings us to a number of workers other than the cultivators, without whose aid the work of the cotton growers, spinners and weavers, and of the food producers, could not be carried on with any great degree of success. We have already seen that up to a certain point specialization is very desirable. For example, the hand-spinners and handloom weavers have developed special nervous sensibility and delicacy of touch, which they soon lose if they give themselves up to any extent to rough agricultural work. It is quite clear also that if all persons are to enjoy the benefits and the products of skilled work, those who are capable only of unskilled labour must do that kind of work for the skilled persons. Thus, one who can do rough work in the fields but cannot make cloths or pots may have cloths and pots all the same if he provides food for the weaver and the potter, but if one man had to be cultivator and weaver and potter and everything else there would be an end of civilization, just as if you had to be not only student, but

had also to provide your own food and clothing and shelter, to be your own potter and shoemaker and cook, and to make your own paper and print your own books, there would be an end to any serious course of study in Science, History or Mathematics.

One of the most important of such workers in an Indian village is the potter, the products of whose art are a prominent part of the furniture of every village household; not only in the kitchen, where earthen cooking vessels are often used, but even more in the spare rooms where huge jars and large and small pots in conical heaps serve to store the household supply of grain and other eatables, safe from the depredations of rats, white ants and other marauders. The potter is a busy man, for every house must have new vessels at least once a year, and he is also required to make earthen lamps, various images of men and animals, and sometimes tiles and bricks.

In Europe, since the introduction of glazed ware, first brought in by the Arabs, the village potter has gradually ceased to exist, for his trade has become highly developed in large factories, and concentrated at huge centres where coal is abundant and the best clay can be easily procured. Such is the case, for example, in the rich coalfields in and about Staffordshire in England, where whole districts are called 'The Potteries' from the extent of their work, and also in similar large centres in Germany, Holland and

other countries. From these places the potters supply table and kitchen ware, generally glazed white and lightly ornamented with bright painted borders and floral and other designs, including cups and saucers, plates, dishes, jars and the like by the million ; and so perfect is the system of communications and commerce that there is scarcely one cottage or house to be found, even in the most remote village, which is not provided with these articles, and also glassware—tumblers, bottles and plate glass—similarly provided by the sister industry of the glass-workers.

There is another village worker of almost equal importance, whose work will never be centralised like that of the potter—that is to say, the village washerman. Where clothing is simple, as in the case of the Indian student, and there is little more than dhoti or pyjamas and shirt for daily washing, there is no need of this functionary. It is much better that when the student bathes in the morning he should follow the ancient rule and wash his own things, thereby obtaining for himself healthy and pleasant exercise and the certainty of a clean start for the day, in accordance with the teachings of ancient gurus. Yet the washerman must exist for the busy workers of home and field and factory, who have not time and energy for washing their own things. If you have lived near a modern Indian mill where thousands of people

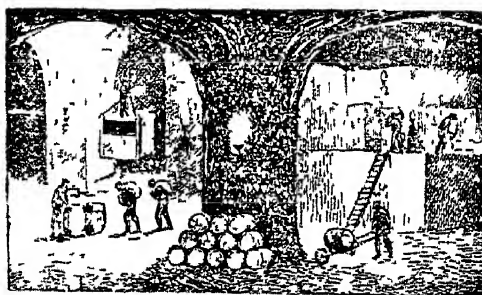
are hard at work for twelve hours of the day, you cannot but have noticed that these poor people are in a state of dirt incompatible with all their religious ideals, and how much they need the services of the dhobi to a greater extent than they can possibly afford. There is an old Indian saying that the washerman is more useful than an educated person, and this draws attention to the fact that the meanest labour has a dignity of its own, for without the humble washerman and washerwoman thrones and council chambers, colleges, factories and homesteads would crumble and perish before the advance of all-conquering dirt and disease. It is very interesting to study the daily round of the old-fashioned village washerman. Each morning early he and his wife set out in different directions to gather soiled clothes and food from the houses. At about ten o'clock they return home, eat their food along with their children, and then proceed to tank or river bank, where they toil in the heat of the sun with such effect that the cloths are ready by dusk. Then they return to the village, sort out the clothes (displaying wonderful powers of memory in this respect) and go their rounds, delivering the washed garments and collecting cooked rice, and finally end the day with this simple meal and go to bed.

In England and America the washing service generally takes one of two distinct forms. One of these is common among the more old-fashioned people,

where a washerwoman comes to the house perhaps once in a week and there is then what is called a washing day, with much boiling, soaping, pegging, rinsing and wringing in the first part of the morning, followed in the middle of the day by much drying on lines in the open air, and in the evening a final drying on the rails of a clothes-horse before the fire, and then the folding and ironing and putting away. The peggy used in the course of these proceedings is a curious-looking instrument with three blunt legs at the bottom and a lever handle at the top by means of which the legs are bumped and twisted in the tub among the clothes, and it does not do one-tenth of the damage that results from the Indian practice of slapping the articles against a stone.

The other mode is that of the laundry, which may be described as a washing factory, where the clothes are collected and returned weekly, and many women are engaged in washing, starching and ironing. In the better laundries there is often steam or electric power and a great deal of machinery in the form of washers and wringers, and there are drying ovens warmed by gas, hot-water pipes or electricity, and there are gas and electric irons. In addition, for cleaning costly woollen and silk garments that would be spoiled by water or by any but gentle treatment, there is often a dry-cleaning department in which various harmless chemicals, such as benzine, turpentine, ammonia and soda are used.

It is not necessary to speak of the blacksmith and the iron works and engineering shops, the shoemaker and the great boot-making centres, the mason and the building trades, the carpenter and the industries that lie between the forest and the carved mahogany chair, the barber and the electric hair-dressing saloons, the cowherd and the model dairies, and hundreds of other workers and industries of the present time. Enough has been said to show that in East and West alike, mutual assistance is the rule of civilization and the foundation of all successful production of wealth by human labour.



CHAPTER XII

ORGANIZATION

LET us suppose for a moment that you are living near a large spinning and weaving mill, which employs perhaps ten thousand people. If you go out at break of day you will see the road full of people, men, women, and children, all hurrying in one direction and disappearing through the factory gates, and the first impression of one who had never been within would be that inside that great building there must be an enormous crowd of mixed humanity all confused together. But go within, and how different is the scene ! All is perfect order and tidiness. Each worker knows exactly where he has to go and what he has to do—one to this room, one to another ; one to this machine, another to the next—and within a short time all are busily at work without the slightest crowding, confusion or disturbance. This perfect order has not come about by chance. There is somewhere in that building a man with ideas about arrangement, and he has ordered all this, and with the help of several lieutenants has appointed the workers to their tasks and allotted the place for each. He is the manager or organizer.

There is another example of this principle near at hand, for you must have a manager in your school dramatic society. This stage manager has probably been placed in power by the general consent of the members of the society, and it is his business to allot their parts to the various players. This is no easy task, for he has not only to judge, let us say in the play of '*Arjuna's Penance*', who will do best for Arjuna on account of appearance, voice and ability to act, but also he has somehow to appease several other players who would like to have the chief part. A particular player may think that he could have played that part better than the one who has been chosen, but for the sake of order and the success of the play he has to accept what is given to him without creating any trouble, so the unsatisfied one must play his minor part, and if he does that well in a number of plays the approval of the audience will sooner or later make itself felt, and impress the stage manager if he has made a mistake in his choice. But the important point is not the success of the individual, but that for the sake of a successful play organization is necessary, and for the sake of organization there must be a manager who will use his best, honest judgment, without partiality, and the players must be willing to support him cheerfully throughout the production, caring more for the success of the play than for any praise or blame that may come to themselves.

The importance of a manager is equally evident in the work of an army when it goes into battle. There must be a general to direct the various forces so that they may co-operate with one another at the point which the general has selected for the attack. Thus the artillery must be directed to prepare the way for the advancing infantry, and they may be arranged behind the lines, to shoot over their heads, clear away barbed wire entanglements from their path and keep down the enemies' fire. The air craft must scout in the required direction and perhaps aid by dropping bombs on the enemy's railway depots and munition dumps. The cavalry must be ready to pursue or outflank. The engineers must dig trenches and burrow tunnels, lay mines and build bridges exactly where required. So each arm must play its own part without thought of its own safety, success or glory, and all must be brought to unity of action by the general who directs the whole battle.

There are many things that are too big to be directed by the knowledge of one man, and people with managing powers in different departments must then co-operate in order to bring them about. One of these is the railway. It is not possible for one man to plan a railway from Madras to Bombay, to prospect the country, supervise the track laying, the adjustment of points and the location of stations, direct the building of engines and rolling stock, arrange the time-table and passenger fares and rates for

freight. There must be a great many organizers of different departments for so gigantic a work,—engineers of different kinds for laying tracks, building engines and so forth, business men to settle fares and freights, and so on, but each one of these, great men as they are, must submit finally to the manager or president of the railroad and upon all important matters accept the decision that he has arrived at with the help and advice of the others. They must serve, like the actors in the play, so that the whole organization may be a success. There are in the world very few people rich enough to start a railroad as you or I might start a shop or a warehouse, for it entails an expenditure of millions of pounds. Another act of co-operation is therefore necessary for this, and the great undertaking is launched when a large number of people put money into it and become partners or shareholders in the concern. There are a few rich people who could do it, such as Vanderbilt, with his sixty million pounds, but they are very few. And it could, of course, be done by Government.

Hence the presence in human society of another class of men than the workers, who are called organizers—managers in different grades, looking after large undertakings, factories and workshops and farms, and enterprises of all kinds such as railways, steamship companies, great building works, banks, and schools and colleges.

CHAPTER XIII

PROTECTION : LAND FORCES

THERE are always in the world some people who would like to acquire riches by force or by stealth, and who are not sufficiently moral to restrain themselves from robbery and theft when opportunity offers. For most of us who are more highly developed in moral character such a desire is almost impossible, for we know that ill-gotten gains would always remind us of the wrong that we had done, and that conscience would for ever sting us with remorse. We know also that such action is against civilization, of which we are staunch and loyal supporters.

Those who have studied the Story of the Shirt will readily see how impossible it would be to carry on highly complex industries with many departments dependent upon one another were raiders or dacoits frequently to sweep down upon the fields and the factories and plunder the crops and the manufactured goods. History is full of accounts of raiders, dacoits, robbers and thieves of all kinds, and we have some of these gentry still with us ; and though they are very few in number as compared with the great

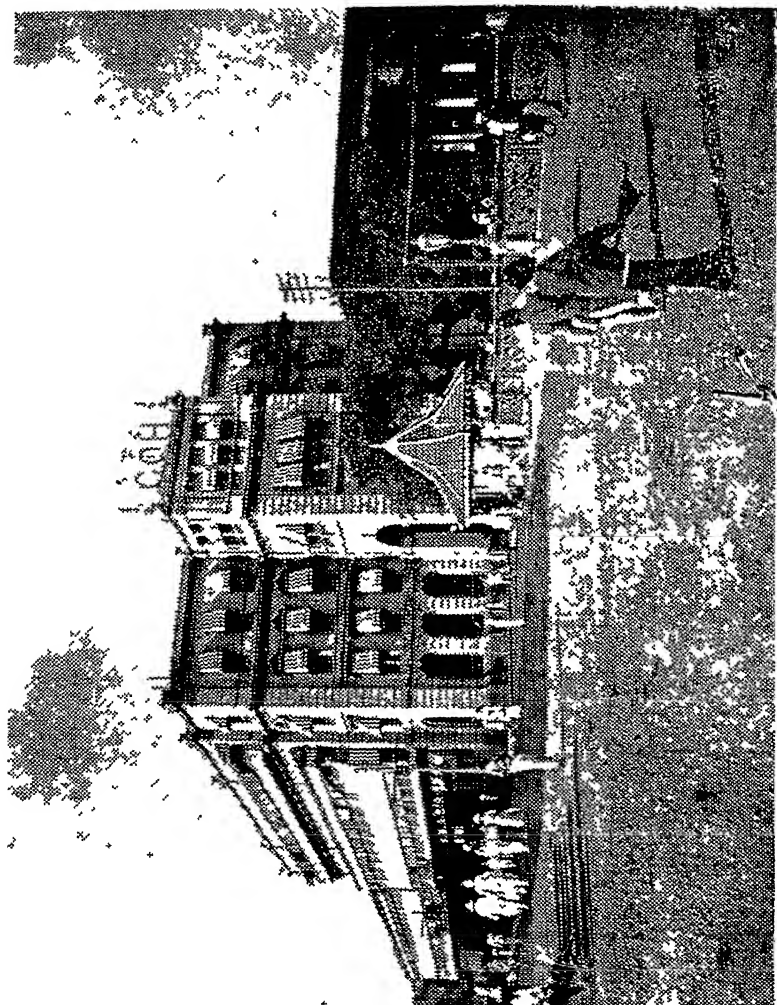
mass of peaceful, honest workers, they could do a lot of harm were not measures taken to protect the latter. India has experienced this on a large scale on many occasions when plundering invaders have swept through the land, as when the Huns destroyed the Gupta Empire, and when the terrible Persian invader Nadir Shah plunged into the country nearly two hundred years ago, desolated the people's homes with frightful cruelty and carried off enormous booty.

It is dangers of this kind that have forced peace-loving peoples to bring into existence what ~~we may~~ call the department of protection in human society—including such organizations as the army and navy, the police force and law-courts. A story is told of an old philosopher who had a handsome metal pot by his door. One day he found that a thief had carried it off, whereupon he shrugged his shoulders and said, "Very well, my fine fellow, next time you come here you shall find a common earthen pot". This little story shows how the presence of thieves makes for voluntary poverty and discourages progress in the production and use of valuable things. It mars our enjoyment of what is rich and beautiful by tainting it with fear of loss, and forces us to build our houses with heavy doors and bolts and bars which among the more timorous make them more like prisons than homes. Worst of all, it produces wide-spread mistrust of humanity and prevents the progress of human



A VILLAGE ROAD

[To face page 366



A' MODERN ROAD

[To face page 367

brotherhood. For fear of robbers and raiders, people in the past crowded their houses together without gardens in narrow lanes within villages and towns often surrounded by walls, the streets were made crooked and tortuous to baffle the designing stranger, and the doors were made low so that horsemen might not ride within, and all these things contributed to the spread of disease, so that indirectly robbers and thieves were the cause of much sickness and death in this way.

Now that raids and dacoity and open robbery are ~~almost~~ a thing of the past, houses are becoming more open, gardens or compounds are increasing in size, and people are no longer afraid of living outside the limits of city and village so that they may enjoy healthful fresh air and communion with Nature. No visitor can fail to notice the great difference produced by this cause between new open cities like Madras, and old ones like Benares or Old Gaya. Especially are the crowded towns with narrow streets to be found in the north, for there, as History records, the cities were constantly harried by invaders and marauders, though this was not so in some of the earlier and more stable times, as in the reign of Samudra Gupta, fifteen hundred years ago, regarding which Fu-Hian the traveller, while writing of the splendour and prosperity of the Empire and the liberty enjoyed by the people, mentions that the roads were free from thieves and travelling was safe.

Almost every civilized nation in modern times has kept up a powerful organised body of men specially trained in the profession of war on land or sea, and quite recently in the air as well. That portion of this force which operates on land is called the army and that of the sea is called the navy, and there are air forces attached to each of these. This is the means adopted for defence against invaders, and it has the merit of providing a special force always ready for fighting, so that the peaceful worker may not be called upon to fight for his possessions at odd times to the detriment of cultivation and ~~manu~~factures. Sometimes a large army is sent abroad, as in the recent great war, when the British within two years enrolled over three million men who volunteered to fight for their country, and sent a great part of them to fight on the Continent of Europe and in Asia and Africa. This was not for aggression, for in these days no self-respecting nation could send forth an army into another nation's country for aggressive purposes, but it was in defence of little Belgium and her Allies, and in opposition to the Kaiser who had developed a huge army for the purpose of dominating Europe and forcing his ideas of civilization upon the world, which he tried to do with incredible ruthlessness and cruelty because he felt sure of success. This was indeed a case of the development of a large army for a wrong purpose—aggression; and had he succeeded in that purpose India

would have come under German domination. That is why, apart from the fact that India is an indispensable part of the British Empire (indeed, the greater part, for its population constitutes about three-fourths of the whole), we find an Indian army of many lakhs of men sent out to fight against the Turk (who had been misled into joining the Germans) in Mesopotamia and Palestine, and against Germans and others on various battle fronts. Indians will always remember that the great glory of victory was chiefly theirs when Turkey fell before them and the entire defeat of the enemy was thus materially brought nearer. Though there was no fighting in England or India, the whole of this work was carried on in defence of the rights of peaceful citizens, with no suspicion of aggression. In this case the British found it necessary, owing to the extremely great strength of the enemy, who had been preparing for war for forty years, to go beyond the limits of the standing army and volunteer army and call up almost all able-bodied men to fight for their country and for their right.

The power of a trained army, well equipped and provided with destructive weapons of modern warfare is something tremendous, before which nothing else on earth can stand. It is not requisite for us to study in this course their awful engines of destruction, such as the gun that threw shells seventy-five miles into Paris and struck a church full of worshippers, of whom seventy-five were killed and ninety wounded,

including a great number of women and children, or the zeppelin aircraft that dropped bombs upon inoffensive citizens, or the quick-firing machine-guns, flame-throwers and gas bombs, for these are not part of civilization, and we have hope that they will soon be banished for ever from human life.

CHAPTER XIV

PROTECTION SEA FORCES

STUDENTS of Indian history are well aware that the last great invasion of India came from the sea, whereas all former ones had come through the passes between the great protecting mountains of the north. Before the development of shipping, which has increased so greatly in speed, safety and capacity in recent times, India enjoyed a great isolation, but for those vulnerable passes of the north, for elsewhere her boundaries are composed entirely of mountains or the sea, and this inevitably led to the development of strong characteristics and at the same time to the neglect of others, so that like every isolated nation (or like every man who has lived very much alone) India presents great virtues and great weaknesses. In every age she developed armies to resist invasion from the north, but of navies she had none.

Contrast with this the history of England, a rich and fertile land approachable only by sea, yet not far from Norway, Denmark, Germany, Holland, Belgium, France and Spain. It tells us of one long series of

invasions from the sea and raids by sea-robbers, from the earliest times. One after another came the Romans, the Angles and Saxons and Jutes, the Vikings, the Danes, the Normans, until the islanders developed what we may call a navy to defend their shores. After that the Spanish, the Dutch, the Danes and the French, all fought sea battles with England's fleet, but were defeated, and it was the waiting British ships that destroyed Napoleon's hopes for a great invasion of England, for which he had gathered an enormous army south of the English Channel. Later still it was the British ships that struck terror into the main German battle-fleet, which throughout the whole of the great War on land, kept itself hidden away behind strong coast defences and an impassible barrier of mines, and dared only to send out small submarine craft that could glide along under the water and deliver their blows by stealth. Not for nothing did the British people spend nearly a million pounds a week upon their navy, their chief defence against any aggressive foe. That sum was nearly double what they spent on their army, and a little more than double what India spent upon hers.

If at any time you pay a visit to Colaba Point and the Bombay harbour you will see there a number of fortified rocks, which are mounted with guns to protect the town from attacks by sea. You may also have read how the Turkish forts of the Dardanelles (aided by mines in the narrow straits) were able to

repel the British and Allied ships, and this may lead you to think that forts are the greatest defence against invasion. It is not so, for, to take the example of India, which has some thousands of miles of coast line, not all the money in the world would be sufficient to build forts all round to defend her shores. But what can defend them is a naval fleet, including a few large battleships, several smaller and swifter battle cruisers and other smaller craft, with aeroplanes to act as eyes ever watchful for the coming enemy. A big battleship is a floating fort of enormous power, and it can be moved almost with the speed of a railway train to defend the endangered spot, or to meet the enemy and settle the issue far out at sea. When the war broke out several German battle-cruisers escaped into open sea, and made it their work to destroy much British and Allied shipping. One of these was the "Emden" which threw several shells into Madras. It was driven off in fear of the land guns, but it was the ships of the British navy that discovered it on the wide ocean, chased it and its fellows, and finally destroyed them or drove them from the seas.

The navy has a still greater effect than what is represented in its defending and destroying power, for it can, if successful, cut off the enemy's supplies to a large extent. In these days of rapid communication, when transport by sea is cheaper and more convenient than that by land, nations have lost their

isolation and become very dependent upon one another. Thus at the beginning of the war Britain found itself in difficulties for the kinds of glassware used in scientific experiments and preparations, and for want of lenses for telescopes and other optical instruments, for these had been coming very largely from Germany and Austria. Great Britain had become mainly a manufacturing country, and had neglected agriculture, so that it grew but a small portion of the food required for its people, and the rest had to be brought in ships from America, Australia, India and other parts of the world, and if the German navy had been powerful enough it could have cut off British supplies and starved the people to death. Similarly, Japan has but little coal, yet needs much for her busy manufactures, and Europe has no cotton, yet must obtain it from abroad. Thus nations, like individuals, take to particular occupations. Holland, for example, makes and exports an enormous amount of cheese, and there are many more cows than people in that country.

The navy not only cuts off the enemy's supplies, but also gives safe convoy to our own merchant marine, and protects them against pirates or sea-robbers. Many are the thrilling stories of past times when pirates and privateers infested the seas, and it was one of the joys of old England in those frank fighting days of semi-civilization to hear of the bold deeds of Drake and other English sea-captains who sailed out

to meet the great Spanish galleons rich with plunder from South America, to hold them up on the high seas and relieve them of their treasure for the benefit of old England. Many were the thrilling adventures and heroic deeds. But the navies of the world have put an end to pirates, and honest people can travel the seas without fear, and privateers or licensed pirates are no longer allowed even in times of war.

These two forces, the army and navy, with the new air force which is still in its infancy, constitute the means of protecting peaceful civilians from external aggression. It is a matter for great regret that people have had to spend so much of their substance on the destructive machinery of war, called armaments, for this greatly impoverishes the country that must do it, as it takes a large number of men away from productive work and thus tends to increase the daily hours of labour and raise the prices of necessary goods. In India especially is this keenly felt, where nearly a third of the entire revenue of the country was spent upon the army, even before the great war.



CHAPTER XV

PROTECTION . THE DEPARTMENT OF JUSTICE

IN the department of protection we come now to the lesser dangers that arise within a country from the presence of thieves and violent persons, who are rare enough when society is well organized and civilization makes some attempt at a just distribution of wealth, the reward of labour with hand or brain. In the case of burglars who break into houses by stealth, of highway robbers who stop travellers on the road, of pickpockets and petty pilferers, and of those who commit assault upon others without serious provocation, the issue is quite clear—these persons are a danger to civilization, and some means must be taken to stop their wrong-doing and to teach them better ways to obtain what they deserve. A Roman philosopher, Seneca, once said that thieves did not desire to do wrong, but did wrong because of their desire for possessions, and that they would prefer to obtain what they so strongly want by honest means could they see them to be within reasonably easy reach.

The instrument that we employ for protecting society against them and for correcting their conduct

is called justice, and of course justice fails unless it performs both these services. Justice should mean justice for both parties, the one wronged and the one who has done wrong, for it means readjustment from a moral point of view. It thus requires reparation or compensation for the injured, and some kind of education for the wrong-doer, followed by a good opportunity to lead an honest life in the future. In the old days of the village communities of India an attempt was made to do justice to one who had been robbed, for it was the custom for the king to recompense the loss to him to whom he could not restore what had been stolen. That custom has now been dropped. And only now is there coming into vogue justice for the thief—that is, his training for an honest occupation and the subsequent opening of an opportunity for him, together with the burial of his past record. This is, however, not widespread at the present time, and the usual method is to punish him, so as to put fear into rogues in general, which, while it restrains the timid and unintelligent ones, makes the others more cunning and desperate than before—more desperate because the detected thief, knowing that he is in for heavy punishment if caught, will readily commit violence and risk the worst in his efforts to escape capture. In his case there is an application of the motto—"A short life and a full one." When sheep-stealing was punished with death and petty theft with the loss of

a hand, there were far more crimes than in later and more humane times.

The machinery in this case is that of the police, with the business of apprehending criminals, including the detective force which brings keen intelligence to bear on the work of tracking and discovering them; secondly, the law courts, with magistrates, munsiffs and judges in various degrees, and thirdly the prison officials who detain the criminals in custody and sometimes attend to their education there. In the village community this department is represented by the head man or village munsiff and the taliyari or village watchman, who are very important persons in their little world. With the reduction of crime, the police have come more and more to the front as valued and trusted servants of the public and helpers in all places of danger, as for example in the busy streets of London, where one policeman may be seen regulating the crush of traffic at a corner, another helping an old lady across the street and even carrying her parcel in that dangerous spot, while a third directs a confused stranger who has lost his way in the maze of streets—and the London policeman is highly respected by the public for his ready courtesy at all times and his unhesitating bravery in face of any danger.

The law serves as a protection for the citizens not only from violence and robbery, but also from abuse and slander, from the tricky debtor who obtains

goods without intending to pay, from the dealer who puts water in milk (though not yet in India), from him who adulterates foods and drugs offered for sale, from him who uses false weights, from him who drives recklessly in the public streets, and from many other dangerous persons, for all such may be called up before a magistrate or judge to account for their injurious conduct, and may be duly checked. Yet there is still much room within the law for cunning persons to do injury to others and to society for their own gain. One such example is that of the war of 'trusts' upon small traders, and others are the systems of 'profiteering' and 'cornering', which we will study in the next lesson.

The law has given equal opportunities to the physically strong and weak; it does not allow the strong man to club his neighbour and take his possessions. It is now coming to that phase of its growth when it is beginning to defend the honest from the cunning, and to protect the poor man from the rich man who can tyrannise over him because of his greater wealth. Let the rich man have his wealth for his own comfort and luxury, but not as a power to deprive others of their little wealth—is the demand of the time that is just newly upon us.

CHAPTER XVI

PROTECTION · THE RICH AND THE POOR

At the close of our last lesson we found that there were still things in which the public needed some sort of protection, as in the case of a war of 'trusts' upon small traders. This may be explained somewhat as follows. We will suppose that there is a big and rich company of manufacturers or merchants with many branches in different places, and that they decide to open a new branch in a small town where there is already a small trader in their line of goods. They may first offer to buy the business of the small trader, and if he refuses they will open a branch of their firm near by and will sell the things that he is selling at prices less than his, often at a loss which they, being rich, can well afford for the time being. In this way they ruin the small trader, who is compelled to sell his stock at a loss or else go away, and then they raise the prices of their goods to the normal standard or even above so that they make great profits in the long run, to the loss of the small trader and the public as well. All sorts of businesses have been ruined in this way, especially in America, and the

public does not usually benefit by it, for the trust when the trade is in its hands can raise the price of its special line of goods. In this we see nothing of cleverness or skill in business—nothing but the use of the brute force of money for the destruction of the weak by the strong

An interesting story bearing upon this subject is told by Dr. Rabindranath Tagore in his “My Reminiscences,” and as it is full of instruction and amusement, albeit somewhat pathetic, we may study it here .

Lured by an advertisement in some paper, my brother Jyotirindra went off one afternoon to an auction sale, and on his return informed us that he had bought a steel hulk for seven thousand rupees ; all that now remained being to put in an engine and some cabins for it to become a full-fledged steamer.

My brother must have thought it a great shame that our countrymen should have their tongues and pens going, but not a single line of steamers . And now that he wanted Indian steamers to ply, he bought an empty old hulk, which in due course was filled, not only with engines and cabins, but with loss and ruin as well . And yet we should remember that all the loss and hardship due to his endeavours fell on him alone, while the gain of experience remained in reserve for the whole country .

On one side was the European Flotilla Company, on the other my brother Jyotirindra alone ; and how tremendous waxed that battle of the mercantile fleets, the people of Khulna and Barisal may still remember. Under the stress of competition steamer was added to steamer, loss piled on loss, while the income dwindled till it ceased to be worth while to print tickets . The golden age dawned on the steamer service between Khulna and Barisal . Not only were the passengers carried free of charge, but they

were offered light refreshment *gratis* as well. Then was found a band of volunteers who, with flags and patriotic songs marched the passengers in procession to the Indian line of steamers. So while there was no want of passengers to carry, every other kind of want began to multiply apace.

Arithmetic remained uninfluenced by patriotic fervour, and while enthusiasm flamed higher and higher to the tune of patriotic songs, three times three went on steadily making nine on the wrong side of the balance-sheet.

The daily bulletins of victory or disaster which used to arrive from the theatre of action kept us in a fever of excitement. Then one day came the news that the steamer "Swadeshi" had fouled the Howrah bridge and sunk. With this last loss my brother completely overstepped the limits of his resources, and there was nothing for it but to wind up the business.

Cornering takes place when, let us say, in time of famine, a rich person succeeds in buying up all the available stores of some necessary article of food, and then sells it at an excessive price. When the great war came and German dyes could not be got, some merchants of Bombay made fortunes in this way by buying up the stocks of dyes available and selling them at perhaps ten to one hundred times their previous prices. This is a tricky way of getting rich quickly by extracting money out of the general public, who must buy coloured cloths. A somewhat similar trick was tried with kerosine oil and petrol by some 'profiteering' dealers who combined to force up prices, but the law stepped in and stopped their little game. In these various forms of business, however, the law on

the whole affords very little protection, and the battle is to the strong—in money.

There is a good deal of discussion at present going on about the protection of infant industries from the competition of foreign ones which have grown into giant size and strength, and the prevention of what is called 'dumping' India in the past was not a poor country, but was rich in manufactures, which, however, were never cheap and poor stuff. The tradition of the people was always to use good things; for example, in the homes water was always carried and stored in excellent metal pots, well made and artistic and capable of lasting from generation to generation, and the cloths of silk and cotton, which were woven with the greatest care and dyed with soft and fast vegetable colours, were both delicate and durable. But now on account of foreign importations there is a tendency to the general use of cheap rubbish—kerosine tins to store water, and cheap foreign silks that soon crack and spoil in the wash because they are not suited to the climate. The tradition of India in this matter is in favour of good and durable articles, and it would have so continued had Indian industries not been afflicted with foreign competition. But now the glitter of cheap rubbish from Japan and the continent of Europe persuades the people to buy, to their own ultimate loss, for they have to buy more frequently, and also to the injury of old Indian industries. Such pouring in of cheap rubbish in great

quantities is called dumping, and there are those who say that the public should be protected by its prevention. On the other hand there are those who say that boundaries between nations are intended only for convenience of organization and should never be used as barriers between the nations on any account whatever, any more than commercial barriers should be set up within the nation between one town and another or one village and another. We cannot decide the merits of the argument here but will take it up again in a later lesson.

We have already seen the effect of a fight between a great trust and a little trader. Many of the manufacturing industries in India are in the position of little traders faced with the competition of foreign giants, who can turn out goods on a huge scale at a low cost. Such is the battle between the Bombay cotton mills and those of Lancashire, in which the former are steadily gaining ground.

CHAPTER XVII

EDUCATION AND INSTRUCTION

Our study of the Story of the Shirt has shown us that men and women do not live as separate beings who can arrange their own affairs without reference to their neighbours. They are rather like the wheels of a clock. In order that that instrument may work well two things at least are necessary : each wheel must be sound and perfect, not cracked or bent or broken, and it must be correctly balanced in its proper place. Then the clock will work well, and each particular wheel will turn smoothly, without friction against its fellow-workers. In considering this we must remember, of course, that human beings are living wheels in a living machine, so they are called upon not to render too great obedience to other persons or the force of circumstances, but to use their own faculties and their own judgment to a great extent ; they are not moved merely from outside, like the wheels of the clock. And they have to preserve truth, honesty, kindness, independence, and the virtues generally, even when it might appear that a lie or a piece of cruelty would be better for the

working of the machine, because to disobey spiritual laws is to soil the purity of your life and your soul and in that measure to distort or bend the wheel and indirectly to do harm to the gigantic machine of human endeavour and general spiritual progress. You will see, therefore, that while the simile of the clock is a good one it fails in at least one important particular.



It follows from this truth that human beings do not live to themselves alone, that each one who is born into the civilized world needs something more than the produce of the earth (food, clothing, shelter and the rest) and the services of the organizers and protectors that we have already studied. He needs also education and instruction to fit him for his future place in the great machine of human society. He will learn to walk and to speak by the promptings of imitation and desire, but something more than these are needed—he must learn to read and write, so that later on he may enjoy the literary treasures of his country and improve himself thereby, and play his part among a literate people. It is true that Akbar, like many other great people of the past, could not read and write, but he always had about him advisers and learned men, and secretaries who could read and write, record for him his thoughts, transmit his written messages and read to him the replies, and he was really a learned man,

fond of great literature, which he encouraged to the utmost. But the average man (other than the simple labourers in remote country places) would be helpless in society without the ability to read, write and calculate, which he needs in his transactions every day, and even for the labourer these arts are desirable in their simplest form.

The education of boys and girls is necessary not only for the sake of their own improvement and enjoyment, but also that they may play an honourable part in the society in which they are destined to move when they grow older. It is thus necessary that they should be prepared in some measure for a definite occupation or a particular department of life, and that they should know something of their relation to their fellow beings, and how to comport themselves in society without awkwardness and difficulty. They must also know something of the laws of health, for how shall they live in society if they are a danger to their fellows by dirty habits, such as that of spitting in public places where germs will arise and infect other people with disease, or that of allowing stagnant water to remain near their houses and breed many mosquitoes that will produce fever among their neighbours? Indeed, all that is good that you learn in school and college by study, by association with others and by the example of elder students and teachers, is intended only for these two purposes: to develop your own powers—mental and

physical, moral and emotional—and to prepare you for an honourable place in society by instructing you in its lore and training you in its ways.

This business of education and instruction of the young is a very large one indeed, for of the three hundred millions of people in India more than half are children, and thus in addition to the great armies of producers, organizers and protectors, there is a fourth army who take up the business of education.

In addition to school teachers, there are in this department of human society many who are specialists in thinking and knowledge, who instruct the adult population and continue their education by writing books for them to read, by delivering lectures and preaching sermons, by producing works of fine art, and so forth. All together these constitute the department of education and instruction. It is their business also to act as custodians of the treasures of the past, as librarians, curators of museums, etcetera, and to form a connecting link between past and future knowledge. We have seen in our studies in the second Stage that the whole of humanity is moving upward step by step, and we may enlarge upon our old simile of the ladder of progress, and say that humanity is climbing a great stairway, and as each century of progress goes by they come to a landing or platform, so that the platform of the present generation of men is higher than that on which their grandfathers stood as a whole. The

instructors and educators must see that that platform is maintained and passed, and that in their own generation there is no tendency of humanity in any department of life to pass downwards to a lower platform, but that there is always a movement upwards towards a higher platform on this stairway of spiritual, moral, mental, emotional and physical progress.



PART III

ORDERS AND FUNCTIONS

- 18. The Four Orders.
 - 19. The Three Functions.
 - 20. The Functions in the School.
 - 21. The Functions in the Home.
 - 22. The Nation and Humanity.
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CHAPTER XVIII

THE FOUR ORDERS

Honour to him who labours day by day
For the world's weal, forgetful of his own,
Like some tall tree that with its stately head
Endures the solar beams, while underneath
It yields refreshing shelter to the weary.

KALIDAS A

WE have now distinguished the occupations of mankind as existing in four orders : the producers, including workers, servants and artizans ; the organizers, including merchants, manufacturers, farmers and managers of all kinds of business ; the protectors, including soldiers, sailors, police, lawyers, judges and kings ; the educators and instructors, including teachers, authors, lecturers, councillors, preachers and artists. In one or other of these four groups each one of us who is to have an occupation will find himself or herself, and in all probability most of the boys will follow the order that their fathers have followed, becoming artizans, merchants, lawyers or teachers—whatever it may be. There are perhaps

one or two out of every ten who will pass out of the orders of their fathers and enter others for which they have a stronger predisposition or a better opportunity.

Human society needs you as a proficient in one or other of these departments, for society is a great organism like the human body, and it has no use for idle members. People who idle their lives away are like the sixth toe that we sometimes see on a defective foot—they do no good and are only a burden upon the producers, organizers, protectors and thinkers. They are superfluous, and in the way. These four orders may be compared with different parts of the human body, such as the feet which support it and carry it along, and the head which contains the specialised organ of thought. Such a simile is helpful as a reminder, but it would be misleading if it led us to despise any particular order, for all are vitally important, and there is no dignity higher than that of work, for which man alone among the animals has the capacity, as we have seen in our studies in the first stage. Rather are the four orders like the four wheels of the chariot of progress of the human race.

When you have selected for yourself an occupation within one of these orders, you have acknowledged a particular set of duties to the world, and these become, in ancient language, your dharma. They are duties that you are in honour bound to perform, for

it is not merely a question of your earning a living, but of your doing your part in the social organism. At the same time they mark out your training ground for the dēvelopment of your powers of mind and body. Thus there is mutual benefit; you perform your function in civilization, and civilization gives you a position in which you can best develop your powers in a way that would not be possible if you lived in a jungle away from the organized world of men that we call society.

Your first duty is to see that your occupation benefits your fellowmen, no matter what it is. If you are a shopkeeper it is your business to see that you are a convenience to the people in your neighbourhood, that you provide the kind of things that will be serviceable to them, so that you can feel, whenever a customer leaves your shop, that he will not regret having bought the article that you sold him. You must therefore make yourself a judge of the honest merits of the things you sell, and your prices must be marked with a fair proportion of profit, and you must avoid those goods which you know to be produced by what is called 'sweated labour', that is by workers who, in extreme necessity, are forced to work too hard, under bad conditions, and for less than a reasonable living wage. If you sell provisions or food, they must not be adulterated—no faked butter or watered milk. In that way you will be doing good to your neighbourhood, you will gain a reputation

for honesty, and people will be glad to trade with you, and thankful that you have helped them to understand that it is better and cheaper to buy occasionally good things that are handsome and durable, than to buy more frequently cheap and showy rubbish.

If you are a pleader you will desire only that the judge before whom you present your case shall know to the full the facts of your case and the truth as you know it, and in this way you will acquire a reputation for honesty, as a man who never cooks a case for a client, so that only those who feel that they are thoroughly in the right will dare to come to you. In this way you will help the magistrate or judge, the honest litigant and the sacred cause of justice whose votary you are.

If you become a teacher or a scientist you will be a devotee of the spotless truth, for it is no business of yours to become an advocate for any particular policy, to suppress the facts that do not suit that policy and lay great emphasis upon those that do, but only to discover and disseminate the truth. When Darwin set out upon his long study of animals and plants, he did not decide beforehand what laws of Nature he would discover to be true, but when he found out after many years of study of Nature that all living beings were linked together in one great family tree, he declared the truth openly, and faced fearlessly the recriminations of the Christians of his time,

who had decided that this was contrary to Christ's teaching, secure in his devotion to the truth wherever it might lead him. How different was this from the policy that was recently carried out in German colleges and schools, where professors and teachers were required to teach as truth only that which suited the Kaiser's policy. So, in writing this book I am trying to help you to understand human life so that you may live well and wisely, and I am trying to put before you the full truth about citizenship as I see it, and not to please any one in power, neither kings, nor priests nor leaders, neither to flatter any nor to judge harshly.

In human life we need above all things sincerity in our dealings and honesty in our purposes. That will make for trust and peace among all men. If you trust me and I do not fail you, I have done you almost the greatest service that one man can do to another, for honesty is better than riches or praise. But where one man treats another deceitfully, cunningly, treacherously, he who is thus deceived begins to suspect humanity everywhere, for he knows not under what fair form treachery may be lurking. With suspicion and mistrust in his soul he is cut off from that full and free intercourse with his fellow-men which is the greatest blessing that civilization has to offer to any one of us. When honesty is a general virtue of mankind we shall be near the Golden Age.

Abou Ben Adhem—may his tribe increase '—
Awoke one night from a deep dream of peace,
And saw, within the moonlight in his room,
Making it rich, and like a lily in bloom,
An Angel writing in a book of gold.
Exceeding peace had made Ben Adhem bold,
And to the presence in the room he said .
“ What writest thou ? ” The vision raised its head,
And with a look made of all sweet accord,
Answered “ The names of those that love the Lord.”
“ And is mine one ? ” said Abou “ Nay, not so,”
Replied the Angel Abou spake more low,
But cheerily still, and said “ I pray thee then
Write me as one that loves his fellow-men ”
The Angel wrote and vanished The next night
It came again with a great wakening light,
And showed the names whom love of God had blest,
And lo ! Ben Adhem's name led all the rest.

LEIGH HUNT



CHAPTER XIX

THE THREE FUNCTIONS

WE will suppose that the school Rambling Club is preparing on Friday evening for an excursion to be made on Sunday, and that the members meet and discuss what shall be the objective of their expedition—a certain hill, or lake, or forest—and appoint several of their number to see that all the members are duly informed and that the various baskets of refreshments and other things that may be required are made ready in good time. Then, when the party is on the road, some become detached and lose their way and go up a side road that leads to some place other than the determined destination, and as they go along a member from the main body comes running after them calling, “You have taken the wrong road! Come back! That is not the way!” We see in this the operation of three functions to which your elders give very high-sounding yet convenient names—the legislative, the executive and the judicial functions. The first has to do with the making of laws and rules, or to decide what shall be done and how, the second is concerned with the

work of carrying out the purpose that has been determined upon, according to the laws or rules that have been made; and the third has the business of seeing that the law is maintained, and of bringing back within its scope those who stray from its behests.

Another example that we may well take is that of the school Library Committee. Those who are members sit together and discuss what shall be the rules for taking out books—this is one kind of legislative or law-making assembly. There is then a librarian appointed to look after the books and see that they are lent out according to the rules—he is the executive servant. Finally, if a borrower breaks the rules, keeps a volume over the time prescribed in the written or printed rules, or handles the books roughly, it is some one's business to bring him to task, point out to him that he has broken the law, and lay upon him the penalty—rebuke, warning, fine, temporary suspension, or whatever it may be—and such person exercises the judicial function.

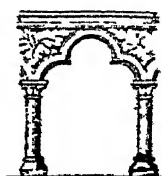
You will see therefore that these big words, the legislative, executive and judicial functions, relate to very simple ideas of duties which are not only carried out by kings and councils, and high public servants, and judges, but also by ordinary people every day and almost every moment of their lives. You perform them all yourself every time that you decide to do something, proceed to carry it out, and then question whether you have done it rightly according

to your original intention. You want to write a letter to your friend, to inform him that you will meet him at a certain time and place. You decide to do it, and thereby make a law for yourself; you proceed to your writing table, and thereby become the executive servant of the law-maker, yourself; and thirdly, you read over your letter and correct any mistakes or expressions that are not clear, and thereby become your own judicial officer. Again, in the cricket club, you have the sports committee which settles when and where the match shall be held and according to what rules (legislative), and appoints the captain and players and those who shall prepare the ground and so forth (executive), and an umpire who shall exercise that judicial function of deciding whether the points are rightly scored and all is fair according to the accepted rules of the game.

The school itself is another example, for in it the Principal or Head Master and his staff perform among them all these three functions. But there are some schools in which the scholars themselves carry on a great part of the judicial function. They have a kind of law-court of their own, conducted by the scholars, generally under the guidance of the Principal or Head Master, and their purpose is to attend to discipline and bring offenders to reason. You know it is a very difficult thing for the Head Master to discover the whole truth when some quarrel has taken place, for he wants to trust his boys and does

not approve that one should bear tales to him against another, yet if he enquires about the matter that has gone wrong he is almost certain to have different accounts of it from different persons, all speaking in good faith. But the boys or girls know much more about the matter and have a very true idea as to where the fault lies, and they can deal with it in their simple court, just as a village panchayat or council can deal best with village troubles, knowing well all the conditions surrounding them. The school court must hold its meetings regularly, when necessary, perhaps twice a month. In it there will be a presiding judge—one of the elder students appointed for a period by the Head Master, and the school prefects will notify complaints to the clerk of the court, who will call the defaulters to appear at the next sitting of the court. All being arrived there, the judge listens to the cause, questions the accused as to their part in the affair and allows them to make their explanations. A jury, of three or five students appointed for the day by the judge, sitting at one side, gives its opinion, after a whispered consultation as to whether the accused is at fault or not, and then the judge acquits him if the jury settles in his favour, or declares the penalty if otherwise. This may generally be a simple reprimand, such as: "For the sake of the honour of the school you are requested not to repeat the offence," accompanied by a few words on the injury that is done to the school and fellow-students

by the commission of such an offence. Offences may consist of such things as gambling, quarrelling, bullying, petty theft, irreverence, breach of school rules, offensive language, etcetera. For a very bad or repeated offence the judge may declare 'Coventry' for a specified period, cutting off the offender from certain social pleasures for the time being, while in cases of extreme wickedness the matter is passed on to the Principal or Head Master.



CHAPTER XX

THE FUNCTIONS IN THE SCHOOL

YOU have learned the nature of the three functions—legislative, executive and judicial—and how they appear in certain organized activities, such as those of a rambling club, a library committee, a cricket team and a school court. The next question that rises is as to the appointment of persons to exercise these functions. It is, of course, quite usual for each person to exercise them all for himself in his own private affairs, but we have seen that there is a great deal of business in which many of us are concerned at the same time—that is, joint business. It may happen, for example, that two persons put their money together for the purpose of opening a small business, let us say for the sale and repair of typewriters, and that they agree to work together in it. One of these is a practical man with a gift for handling delicate machinery, and the other is one who has had a more theoretical education ; so they agree that one shall manage the workshop and the other the office, and in their own departments each shall have full authority. But they discuss together all general

affairs of the business, such as expenditure on rents or equipment, or advertisements or anything of that kind and in this they really form a little legislative committee or council of their own. In all affairs where there is a joint interest there must be some such committee of management, unless those interested agree to entrust it entirely to one person.

We see this principle at work in the school, where there is a great deal of organization to be done. There are subjects of study to be arranged, and teachers to be appointed to their subjects and classes and times of work, and classes to be appointed to their various rooms, and in addition there is the business of keeping good discipline or order, seeing to the efficiency of games, looking after buildings and grounds and sanitary arrangements, and many other things. All this is generally under the control of the Principal or Head Master, who delegates various parts of the work to different teachers and assistants and sometimes to some of the pupils.

In some of the best schools of England and America there have long been systems of school government in which the students help the Principal in some of his legislative, executive and judicial work. The purpose of this is to train the students in the exercise of the three functions, and in self-rule. "Self-rule or self-dependence," says Manu, "is happiness, rule by others is misery." Self-rule

means first the ability to rule or control yourself, and then to order or rule your life. You and I have self-rule, for example, in the matter of theft. We may see something that we should like that does not belong to us, but we shall not attempt to steal it, because we have self-control and we know that theft is wrong. But the criminal, who has not self-rule, needs rule by others—hence the laws against theft. We are unconscious of any restraint in the matter, and we are happy; but he feels restraint and is unhappy. Indeed, it may be said that the laws against theft exist only for him.

One of the methods employed for training students to assist in the management of their school is that of Prefects and Monitors. There are perhaps ten Prefects who are elected from the members of the Fifth and Sixth forms, or the two highest classes, by the students of those classes and all the members of the staff. These Prefects will hold meetings occasionally for apportioning duties among themselves, such as supervision of playing fields and gardens, making arrangements for celebrations, attending to sanitary matters, forming a court (as mentioned in our last chapter), appointing a committee for a rambling club or library, and so forth. It is their duty to assist in the maintenance of good order and the honour of the school, and to refer any offenders to the meetings of the court when words of personal advice have proved ineffective. Their authority

extends over the whole school and everywhere except within the students' homes.

In addition to these there are two Monitors in each class, elected by all the members of the class and all teachers who have any work in the class. Their authority does not extend beyond the class room and it is their business to assist the teacher by recording attendance, and seeing that the room is always tidy and clean, that blackboard and chalk are ready and desks and pictures quite straight, and that work goes on quietly in the absence of the teacher.

It is necessary now to explain what is meant by election. When a person is appointed to a post of legislative, executive, or judicial duty by the will of the majority of his fellows he is said to be elected. Thus a Prefect is elected if he is put in office by his class-mates and teachers; he is appointed if the Principal or Head Master puts him there by his own sole authority. The election properly carried out is by ballot. In this case we will suppose that the two Monitors are to be elected in a class. Each student in the class and every teacher of the class is given a special slip of paper, on which he writes the two names that he prefers. The folded slips are then collected and examined, the votes are counted, and the two students who have gained the most votes are declared to be elected to the posts of honour and responsibility.

When Prefects and Monitors are thus elected every one in the school is assisting in the management or government of the school, and much of the ~~success~~ and good working of the institution depends upon their wise selection. The vote thus carries with it a great deal of moral responsibility, and its use in the school teaches the scholars how to employ it when they as men and women take their part in the management of affairs as voters in the larger world of public life. It is assumed that you are given a vote because your honest opinion is wanted as to who will be the best person to hold office. You must therefore vote for that one who you think will be best for the class or the school, after carefully considering the matter, not for what somebody else thinks best. It is your duty to use your own judgment in the matter, and not to be guided by others, for if you have no opinion of your own you ought not to have a vote, or if you have one you ought not to use it. And you ought not to vote for a person because he is your special friend, because you like him very much or he likes you, but simply for the person whom you think most suitable for carrying on the work. No one has a right to ask you to vote for a particular person, and you have no right to promise that you will, and it is not desirable that you should tell anybody for whom you have voted. Indeed, if any person tries to persuade you to vote for him, or gets others to do so, you will be well

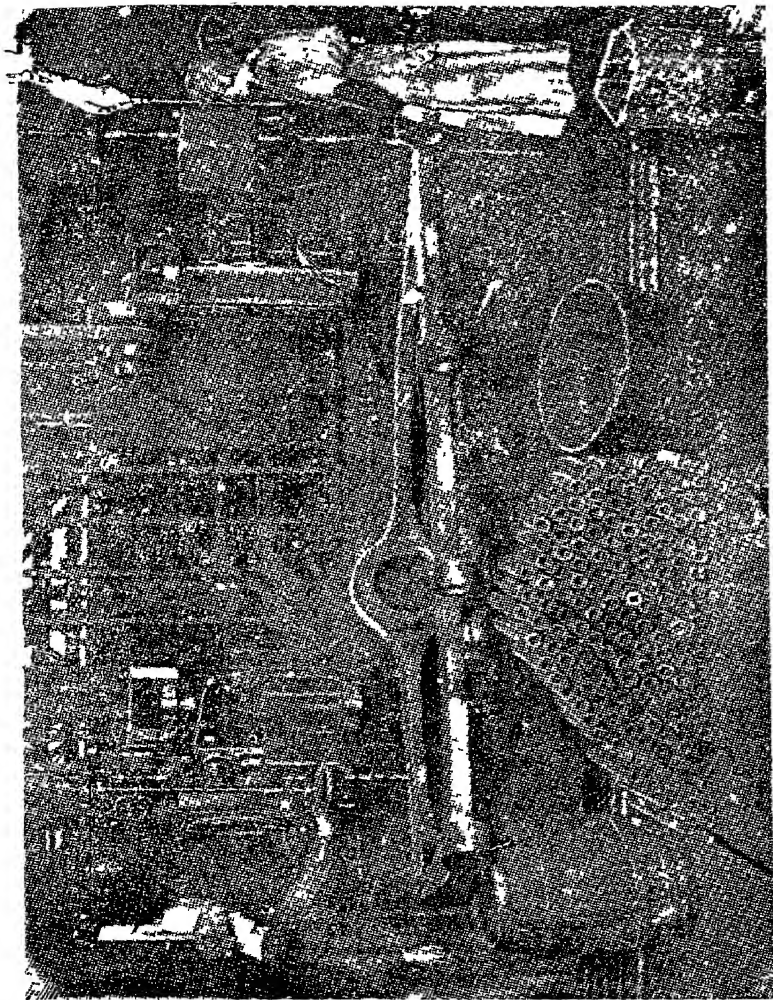
advised to vote for some one else, because that person is thinking too much of himself, and is not trusting ~~his~~ companions to give the best judgment by their own uninfluenced vote. But if each voter puts down the names of those whom he honestly thinks most capable, the election is bound to be a good one.

CHAPTER XXI

THE FUNCTIONS IN THE HOME

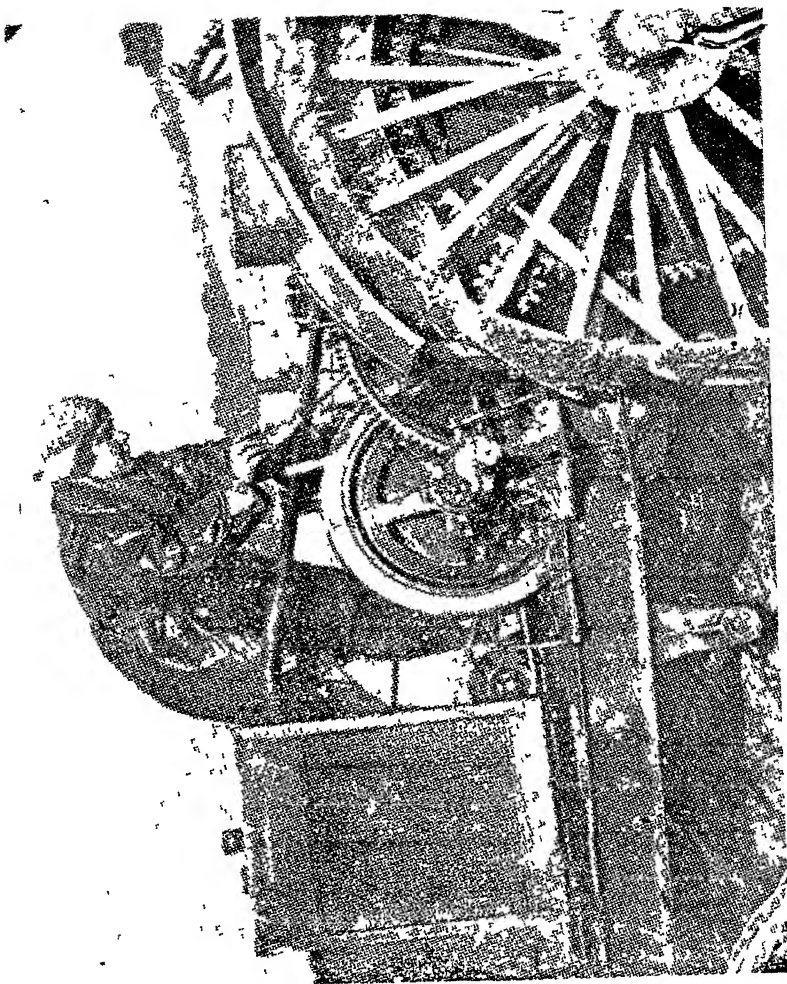
ANOTHER place where you will have noticed the functions at work is the home, where the family consists essentially of father, mother and children. Here the father and mother, generally in consultation, decide what is best for the children, and each takes executive authority in that department which is specially his, the mother attending to health and food and the teaching of the very young, and the father deciding those matters that concern the outer world, such as schooling and travel ; while the children obey the parents to whom they owe their birth and nationality and who, in the course of Nature, love them and make sacrifices for their welfare more than any other person is likely to do, until they grow up, become independent, and become fathers and mothers in turn, and the love between them and their parents is then second to that between husband and wife.

For a number of centuries, during a lawless period in the world's history, the mothers of the race have suffered very much from excessive seclusion, which has left them very small in stature as compared with



WOMEN AT A RADIAL DRILL

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OILING HER TRACTOR

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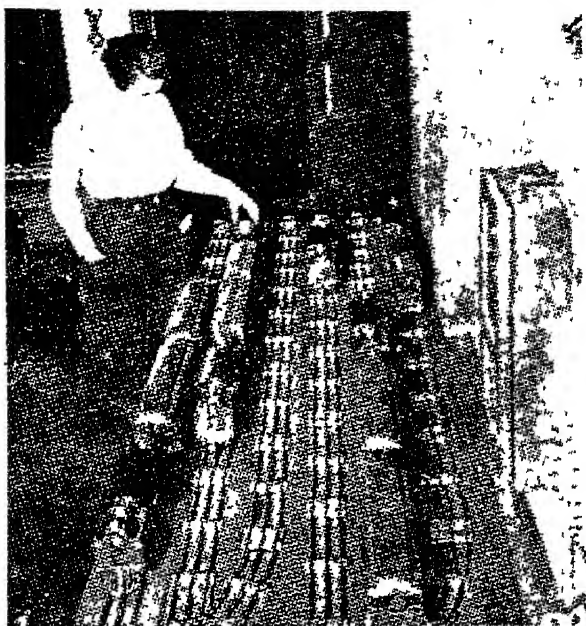
their brothers and husbands, and also weak in health and strength, nervous in temperament, often liable to ~~anæmia~~ *anæmia*, and untrained for comradeship. But as the nations have settled down to internal quietude, and roads and other public places have become safer and violence more rare, there has been a gradual change, so that in England and America, lands of liberty and peace, women may move about and travel in public freely and safely, always assured of honour and respect. In the time of their great-grandmothers they were as much secluded as the South Indian women of the present day, and they shared the small stature, general weakness and defects of character resulting from that seclusion, but since their emancipation they have become taller and more beautiful and well-proportioned, healthier and happier, full of comradeship and loyalty to husbands and brothers, and an invaluable softening and sweetening influence in all the affairs of the outer world, where formerly man owned a rule that was coarse and rough without their influence. The woman of the present day, tall, strong, well educated, open-minded, happy, free and brave (like some of the ancient Indian ladies, such as Mīrābai, Tārābai, Chānd Bībī, Ahalya Bai, Nūr Jehan and others of history, and such as Subhadrā, Draupadī, Gārgī and Maitreyī of the classics) are reforming the world by their presence in active life, and are proving themselves better mothers than were known before, for they have lost nothing in tenderness of

love, and have gained much in health, wisdom and practicality.

All the world knows how the women of Britain the allied countries came forward during the great war and proved themselves to have as much courage, intelligence and ability in every possible kind of work as men had ever exhibited. Within a fortnight from the commencement over ten thousand English women enrolled themselves for service often attended with the greatest danger, and towards the end of the war there were about one million British women in the munitions departments alone. No one could be more heroic than those brave women who went to nurse the wounded near the battle-fields, and many were those who were injured and killed by the enemy's shells. Other nurses faced the terrors of the deep on hospital ships, and many were sunk by the deadly submarine craft of the enemy. Among them there was not only that unfailing patience which is one of their best characteristics, but the highest order of medical skill and administrative and managing ability, as for example in one of the Royal Army Medical Corps hospitals in London, which was conducted solely by women and included fully qualified doctors as well as administrators and nurses.

Thousands turned out from their comfortable homes and worked on the land, often toiling in the fields by moonlight, to provide food for the soldiers, and others took to motor driving, and might be seen

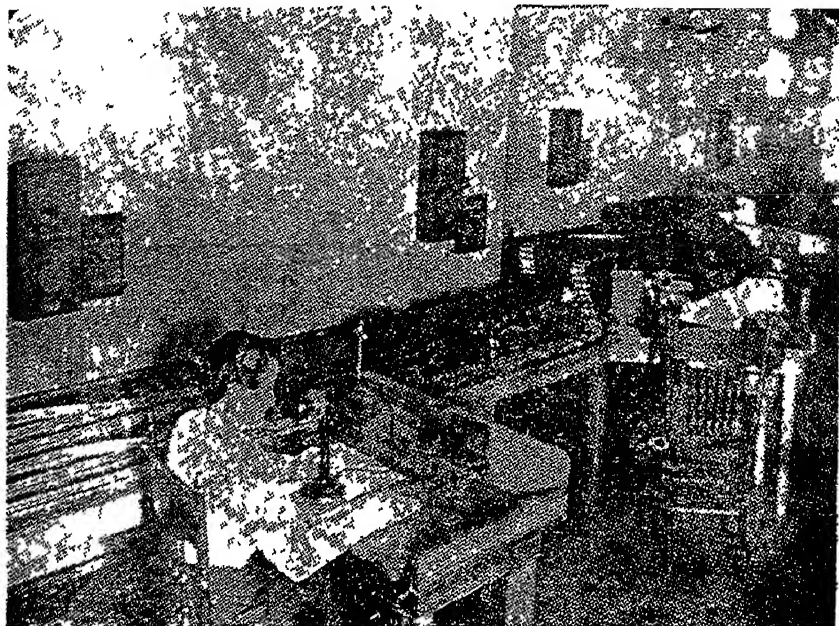
rushing through the busy streets of London not only with ordinary cars and giant motor-omnibuses,



IN A RAILWAY SCHOOL

but also with huge delivery vans and trucks—an occupation sufficient to try the nerve of the most dauntless. In one of our pictures you will see others learning with the aid of a model railway in a railway training school how to manage train services; in another they are at work with powerful machines in a huge factory, and in still another we see one oiling her tractor in the course of her farm work. They manned, if the expression may be allowed, the offices, warehouses, schools, postal and telegraph and telephone services, and a hundred other businesses, and acted as interpreters, teachers, clerks, cooks, gardeners, managers of all kinds, railway and omnibus

conductors, and in no one can think how many other kinds of honourable service, and in every case did



IN A RAILWAY SCHOOL

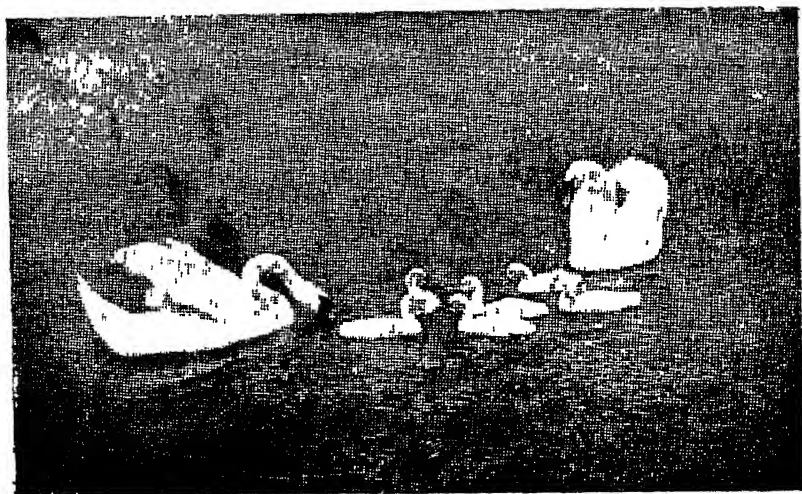
they prove themselves the equal of men in every respect in all but the very heaviest occupations of manual labour.

What a marvel all this would seem to the great-grandmothers of the present generation if they were to look down upon it from their stations in the other worlds, for times have lately changed with unexampled rapidity. Indeed, there are still some who think that the father should be the great law-giver and the mother his humble servant in the home, working day and night at that service of which it is

said that "woman's work is never done" because it comes round and round again with unending monotony. According to this view woman is "to keep as quiet as possible, know as little as possible, hear and see and enquire about nothing, and above all to avoid being herself the subject of conversation or enquiry; in short, the sole end and object of her existence is to act as a good head-servant, yielding to her husband a servile obedience, regulating the affairs of his family, preparing his daily food and superintending his household". Such are not the patterns of women, the wives of Shiva, Vishnu and Brahmā, as for example Sarasvatī, acclaimed the goddess of speech and eloquence, patroness of the arts and sciences, and inventress of the Sanskrit language.

It is often said that the home is woman's sphere, and that is undoubtedly true, as it may be said that the office or the shop is man's sphere. When man has done his day's work there is for him a change into recreative freedom of activity or rest as he may choose, and woman needs this change as much as he. Outside business their interests, enjoyments and education ought to be similar, and their companionship is now being carried more and more into all affairs, where before she spent her dull evening hours in patient waiting indoors, while my lord her husband sought solace and refreshment in his club, with its tennis, cigarettes, lemonade and cards—an unhealthy disunion, injurious to husband and wife and children all alike.

Times have changed in the West, that is all, and they are changing in India, too. The éra of loving comradeship has come and there is approaching the end of that in which one is in bondage to the other, and revenges herself in old age upon the tyrant by a worse tyranny of tears and endless bitter words.



A HAPPY FAMILY

CHAPTER XXII

THE NATION AND HUMANITY

United in progress and in speech, let your minds apprehend alike. Alike in council and in prayer, alike in feelings and in thought, be ye one in your aspirations and your desires, and may your minds be drawn together to bear with one another

Rig-Veda

IN this last lesson of the Junior Course of our study in Citizenship, we may recapitulate the chief truths that have been learnt. The first great truth is that of the world-wide co-operation and solidarity of humanity. This word solidarity means unity of interest, and includes the ideas that what is essentially good for one man is good for another, that when one truly benefits there is also benefit to others, and that when one makes a worthy achievement all benefit by it before long, without respect to race, creed, sex or colour. In all these essential things the boundaries of nations make no difference. Boundaries are necessary to mark out social groups for convenience of administration and for the expression of national types, as for example India, the land of the essentially religious nation, which is always looking to spiritual ends and testing the world's gifts and methods in the light of their subservience to these ;

Germany, the country of the studious nation, with its tireless patience in the pursuit of knowledge and learning; America, the home of the inventive nation that is always seeking new and better and cleaner ways of doing everything; Britain, the land of individual freedom, that has always loved liberty and the free communion of nations, and has ever sprung to unready arms in defence of peace; and many another, each standing for some quality in the world family of nations, just as in a village there are different types of men, of whom none is perfect yet each is very useful to the others so long as they do not quarrel.

When we realise this truth it is wise to take care not to exaggerate the value of specialization in individuals and nations. There is such a possibility as over-specialization, and we often see it in a person who is so devoted to a special pursuit that he loses touch with the rest of humanity and does not understand their thoughts and feelings. So while the 'national occupation' should be striking and strong for the world to see and profit by, the nation should share to the full the life of its time, and enter freely into all those interests and activities which belong to all humanity, only colouring them with its own special type. A hermit nation may be exceedingly strong in certain qualities, but is likely to be narrow-minded and proud. We should think of our own motherland in the broad-minded way, and cherish

her for her services to us her sons and daughters, and guard her place among the nations as a benefactor of humanity. Another simile that might help a little is* that of the school with many teachers ; all the human beings on earth are the pupils, and the nations are the teachers with their various special subjects, and the school is one. *Boundaries* to nations there are and must be, but let them never be converted into *barriers* to separate, even in thought, a humanity that is essentially one, sharing the fruits of all the past, and in the present mingling in a common prosperity that is based upon their interdependence and freedom of communication.

Where the mind is without fear and the head is
held high,
Where knowledge is free ;
Where the world has not been broken up into
fragments by narrow domestic walls ;
Where words come out from the depth of truth ;
Where tireless striving stretches its arms towards
perfection ,
Where the clear stream of reason has not lost its
way into the dreary desert sand of dead habit ;
Where the mind is led forward by thee into ever-
widening thought and action—
Into that heaven of freedom, my Father, let my
country awake ¹

The second great truth is that in your own life character is more important than riches or learning. Preserve the integrity of your soul at all costs. In our study of the benefactors of humanity, we have

seen that it was noble qualities of character that made them great and useful. Unflinching courage, perseverance, patience, truth and kindness—these are the qualities that make individuals great and cause their lives to be a blessing to the world. If you want a guide in this matter, something to remember daily when you rise in the morning and to question yourself about when you retire to rest at night, take the three fundamental qualities of courage, truth and love as the foundations, walls and roof of the building of character, and determine each day that the structure shall be built firm and true. Let the foundations of courage be strong and firm; the walls of truth be straight and pure, and the roof of love be sound, so that there is protection for all who enter that temple. Build in no bad bricks; allow no careless workmanship; for it is quality, not size, that is important in this building of character, as is the case in all spiritual things

THE NATIONAL SONG

GOD SAVE OUR IND

God save our Motherland,
God bless our much-loved Land,
God save our Ind !

Sing of her story old,
Sing of her heroes bold,
Sing of her hearts of gold,
God save our Ind !

Sing Ramachandra's praise,
Sing of the Rajput days,
God save our Ind !

Sing of great Akbar's sway,
Sing of Sivaji's day,
Sing boldly Freedom's lay,
God save our Ind !

Lord of the Burning-ground,
Send forth Thy damru-sound,
God save our Ind !

Grant us the hero heart,
Careless of loss or smart,
To play a noble part,
God save our Ind !



APPENDIX

PRACTICAL CIVICS

IN various articles written for magazines and newspapers I have divided Practical Civics into three departments: (1) Joint Work, (2) Self-Government, and (3) Social Life and Games, with two supplementary activities which belong very largely to the theoretical side of the subject (4) The Morning News, and (5) The Patriotic Period. For the present purpose these need be outlined but briefly, as the details are best worked out in the school with local initiative.

(1) *Joint Work.* Once a term at least every student should take part in a good piece of work done with others for the benefit of others, and generally for the benefit of the school. Early in the term, a list of the students may be made, divided into groups according to the nature of the work that each undertakes to perform. If there are some who have a knowledge of carpentry, they may perhaps undertake to produce a carved platform front for the school hall, obtaining instruction from the local carpenter, if necessary, but jealously keeping all the work for themselves; others

might undertake to produce a special set of furniture for the room in which the Head Master receives his visitors ; others of a still more artistic turn might carve wooden pictures to be placed over the doors ; while others might model busts and draw and frame portraits of great men. Some specially interested in Geography may produce maps and charts of all kinds under the direction of their teacher (Geography is a subject that induces enthusiasm), while those who have become inspired in the Civics lessons with the history of trades may reproduce on a large scale suitable pictures taken from the books. In one of the schools with which I am connected, boys of Form III are making for the use of the upper forms test-tube racks and holders which I can confidently say are better and more neatly finished than any that I have seen imported from Europe. Great will be their delight when they come up to Form IV and begin to use those things themselves in the chemistry class. For those who prefer outdoor work there is the school garden, and work on the improvement of the grounds. There is no limit to the variety of useful articles which will suggest themselves to the students in the school when the prefects call over the rolls for this purpose near the beginning of the term ; and as trophies of work increase in the school, each new boy who comes in and discovers how the school came by its treasures of utility and art will be anxious to share the honour with those who have worked in the past. In the

work, he will learn the value of a number working together at a single task; he will learn also the delight that comes from working for others; and while this is going on during a number of years he will be developing that communal consciousness which is the best asset of a good citizen.

(2) *Self-Government*. Prefect and monitorial systems are now well-known. They vary from the simple forms in which certain duties are entrusted to boys and to committees of boys, to more elaborate forms common enough in the best schools of England, in which the boys are encouraged to rule themselves as in a small state. A beginning may be made with special committees entrusted with the management of various affairs, such as a special student's lending library, the good order of the laboratory, the grounds and gardens, the recording and celebration of events of national importance, the organisation of dramatic performances and entertainments, and excursions. The secretaries of these committees should keep in close touch with each other, and once a term there may be a general parliament of all the committees, together with the prefects who look after discipline, and the monitors who help the teachers in the classrooms.

(3) *Social Life and Games*. It is impossible to extol too highly the English devotion to games in schools. Nothing in school life contributes more to the development of men of courage; and in the

playing-fields alone, it may be said with regard to most schools, we find high qualities of co-operation and comradeship ; and though it has often been said that boys brought up chiefly on games are not the best for steady work, India is not likely to err on the side of excess in this matter, as so far she has been all too indifferent in the pursuit of the games that boys need for health and physical growth. Excessive studies for examination purposes are responsible for this, but it is beginning to be understood that those studies should be confined to a few hours each day, if only for the sake of that health and brightness which is requisite for success in the examination room. To this must be added all kinds of social activities, social gatherings, debates, devotional meetings, music and singing parties, lectures and magic lantern shows, dramatic performances, excursions, and exhibitions—all of which play their part in awakening the faculties of the young to vivid and interested life. In the Colleges, debates and parliaments should include all questions of the day, and whenever a famous man visits the town, he should be invited to address the school and college students in the hall, on the subjects that are nearest to his own heart—religious, social or literary, or whatever they may be, and on these matters the schools should stand for a tolerant hearing of all extremes.

(4) *The Morning News.* A simple address for ten minutes on some of the day's news may be given daily

to the assembled school after the morning prayer, say on three days of the week, and the other two days may be reserved for suitable addresses on qualities or virtues.

(5) *The Patriotic Period.* A full life for man, as distinct from that of the merely rationalised animal, is one that includes some enjoyment of art, knowledge, invention and discovery, both internal and external, and above all some enjoyment of living for others, of rejoicing in their happiness, of sorrowing with their afflictions, of comradeship with man, that appears in the nation as patriotism—an abounding love for one's nation and country, which provides inspiration for a purpose in life, in the pursuit of knowledge, in the exercise of the emotions, and in the development of all one's physical powers. The nation with this sense developed is bound to be great in character and resourcefulness, for it will be very much alive. No nation has been more active than the British in the pursuit of this ideal and the living fire of patriotism that is in the hearts of the people is first fanned into flame in the schools and colleges of the land. In some of the high schools and colleges with which I am connected we have been carrying on for some time what I call the Patriotic Period. This occupies about forty minutes once a week, preferably the last period of the day. Then all the students of the upper forms on one occasion, and all those of the lower forms on another,

are gathered together in the school hall, or in some other large room, to hear of the life and deeds or works of one of India's famous sons.

In the period of the patriotic address we honour these worthy ones as far as possible with Indian conditions. The school hall should always be Indian in aspect, with Indian pictures on the walls, Indian busts on brackets or pedestals, Indian mottoes and Indian furniture; but especially on the occasion of the patriotic address should it be Indian, and every student, whatever the shade of his sect or caste, should feel himself a son of India, inheriting something of the glory of the great men whom he admires, and fully realising that as an Indian he has something of definite value to contribute to his nation and to the world. In the hall no chairs, tables or benches are necessary for this occasion. The teacher who delivers the address should have his chauki on which he sits, and beside him if possible there should be an easel bearing a garlanded portrait of the son of India about whom he speaks, while all the students should be gathered before him sitting cross-legged upon a carpet in the centre of the room. A few chairs or benches may perhaps be placed round the side and end walls for the accommodation of the fathers and mothers of the pupils, if they care to attend.

These addresses are a source of joy impossible to describe and the teacher who out of love has spent his leisure time in preparing his subject is rewarded

beyond measure by the delight that his work gives to the hundreds of students before him, and the realisation that comes to him of the living, throbbing life of India's sons. He comes in touch once again with that force of character stirring within them, which, expressed in outward life, made India a centre of splendid culture and civilization when Europe was sunk in the depths of barbarism. The boys who throng our high schools and colleges have an ancestry which, were it traced back a thousand or five thousand years, would be found to contain elements of dignity and culture before which all must bow with reverence and respect. That past greatness has not died out of the stock; it is only slumbering within them, waiting the moment for self-expression, which is at hand. Let us liken them to a slumbering volcano, not as a type of destruction, but of power and fertility. Some day the long-closed pipe of the volcano will open again, and out will well the rich stream of fertilising lava, to cover up and bury for ever the dull ignominy of present day life, and form the soil of a splendid, powerful and joyous civilization, in which love of country and of mankind will be joined with practical knowledge into a wisdom that alone can make for permanent happiness and success.